The Victorian Naturalist

The Magazine of the
FIELD NATURALISTS CLUB OF VICTORIA
in which is incorporated
The Microscopical Society of Victoria

Vol. 100

January-December, 1983

COMPILED BY K. N. BELL

MOLLUSCS

OBITUARY

OMMISSIONS AND ERRATA

PLACES AND LOCALITIES

PLANTS

SPIDERS

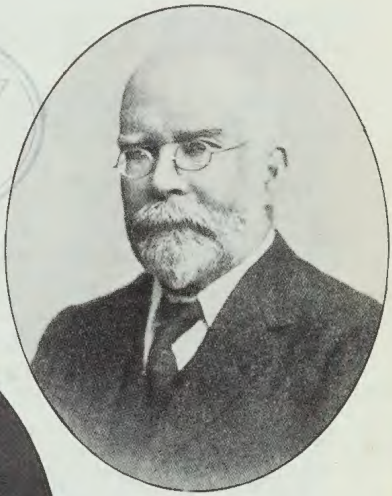
The Victorian Naturalist

Vol. 101 (1) Jan/Feb 1984

Centenary Issue 1884-1984

LUCAS

NATIONAL HERBARIUM
10 FEB 1984
OF VICTORIA



BARNARD

BARRETT

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GENERAL MEETINGS

Monday, 13th February, 8.00 p.m.
Dr Beth Gott. The use of plants by Victorian Aborigines.

Monday, 19th March, 8.00 p.m.
Dr Jim Willis. Offshore islands for the naturalist. NOTE ALTERATION OF DATE.

Monday, 16th April, 8.00 p.m.
Peter Gell. Birds of Mallee remnants. NOTE ALTERATION OF DATE.

New Members — January/February General Meetings

Metropolitan

Alan Andersen, C/o Botany Dept., Uni. of Melbourne (Botany).
Louise Kearney, 2A Rugby Rd., Oakleigh (Entomology).
Graeme Robson, 7 Gordon St., Hampton.
Laurie Thomson, 57 Bishop St., Oakleigh.

Country

Russell Henry, 'Tangaringy', Francis Rd., Glengarry West (Botany).

Joint

Colin & Neena Ackehurst, 21 Gardenia St., Pakenham (Geology & Botany).
Denise McCartin, 19 Marco Polo St., Essendon.
Mrs J. Wilbraham, 15 Kenwood St., Boolarra.

FNCV EXCURSIONS

February 11-12th, Murrindindi — joint excursion see last Naturalist. Contact Wendy Clark, ph. 859 8091.

Sunday, 4th March, Burnley Gardens and Wattle Park. Leader: Jack Wilson. Meet at 10.30 a.m. at entrance to Burnley Gardens near tram stop number 18 in Swan Street.

Saturday — Monday, 10-12th March, Creswick. This is the Victorian Field Naturalists Club's Association annual combined weekend which will be hosted this year by the Creswick Club. Meet at St Paul's Hall, Napier Street, Creswick at 1.00 p.m. for an afternoon excursion of historical and geological interest, followed by an evening meeting at 8.00 p.m. in St Paul's Hall. Sunday, 9.30 a.m. to 4.30 p.m. day excursion, bring picnic lunch. 8.00 p.m. Club reports and social evening at St Paul's. Monday 9.30 a.m. to 12 noon, excursion, then picnic lunch and farewell. There is a caravan park (phone 053 45 2411) for those camping (which is only 400 metres from the P.O.) in Cushing Street. A coach and motel accommodation has been booked for members not wishing to camp. Coach and accommodation, B and LB is $85.00, when booking please include $20.00 deposit. The coach will leave Flinders Street outside the Gas and Fuel building at 8.30 a.m. Bring picnic lunches. These weekends provide a wonderful opportunity of meeting naturalists from other parts of Victoria so come if you can.

March 10, 11, 12th, Cape Liptrap — combined group excursion/survey. Interesting geology fossils on Digger Island, mammal trappings etc. Contact Julian Grusovin ph. 387 7151.

Sunday, 1st April. Yea area. This excursion will be led by Mr. G. Love and will deal mainly with fossils of the district. The coach will leave Batman Avenue at 9.15 a.m., fare $9.00. Bring a picnic lunch.

Friday, 20th — Wednesday, 25th April (Good Friday to Anzac Day). Mildura, with day excursions to places such as Hattah Lakes and possibly Walls of China, etc. A coach has been chartered and motel accommodation booked on a D.B.B. basis. The coach will leave from Flinders Street, outside the Gas and Fuel building at 8.00 a.m. Bring a picnic lunch. Cost $220.00, a deposit of $50.00 should be paid when booking.

April 20-25th (Easter/Anzac Day). Rodger River, East Gippsland. Joint excursion with the Mammal Survey Group. Contact Lance Williams ph. 879 1962.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Mammal Survey Group.

February, 11th — 12th. Murrindindi.

March 10, 11, 12th. Cape Litrap.

April 20th — 25th (Easter/Anzac Day). Rodger River.

Botany Group

Saturday, 25th February. East Warbuton. Arthur Thies.

Saturday, 31st March. Berries — Upper Thomson Valley.

Saturday, 28th April. Anglesea — Autumn orchids.

(Continued on page 55)

NATIONAL MUSEUM
10 FEB 1984
OF VICTORIA

The Victorian Naturalist

Vol. 101 (1) Jan/Feb 1984

Editorial Committee: B. J. Smith, P. Lawson,
D. McClellan, J. Phillips, R. Thomson, L. Williams.

Centenary Issue 1884-1984

Cover illustration: The first three editors of the *Victorian Naturalist*, Lucas 1884-1892; Barnard 1893-1925; Barrett 1925-1939.

100 Years of the *Victorian Naturalist*

It is with great pleasure that I write this introduction to the Centenary Issue of the *Victorian Naturalist,* which is, today, a journal of great standing in the community. It admirably bridges the gap between the professional scientist and the amateur naturalist, allowing relatively quick publication of material ranging from reports of casual observations to full scientific papers. Due to its broad content it also caters for a wide range of readers, from the beginner to the professional naturalist.

It is now one hundred years since the members decided that they should have a journal totally dedicated to publishing articles on natural history and the activities of the Field Naturalists Club. Prior to that, proceedings and papers were published in the *Southern Science Record,* a journal set up and owned by a member, Joseph Wing. For four years this journal provided a useful service but the Club's needs outgrew what space the *Record* could provide. Thus the *Victorian Naturalist* was commenced in 1884.

The journal has provided a vehicle for recording all the activities of the Club, which make up its history. It has reported the proceedings of meetings, the exhibits shown and the talks given, and has given detailed reports of excursions, including plant and animal lists for the areas visited. Lists and reports like these, of the early years, have recently proved invaluable as sources of information in such exercises as restoring and replanting areas back to their original vegetation patterns or for monitoring changes in our environment and making representation for conservation of areas. The *Naturalist* has also shown the Club growing from strength to strength and its expansion into specialist areas with the formation of the various Groups. It has then been a vehicle for reports and papers from group members on fields as diverse as microscopy, geology and mammal survey.

The *Naturalist* has also reported and documented the conservation battles fought by the Club in conjunction with other conservation bodies and alone. Some of the areas the Club helped to be set aside for conservation purposes include the Little Desert, Wyperfeld, Sperm Whale Head, Wilson's Promontory, Mt Buffalo, Kinglake and many others. In reading these accounts one is spurred on to keep up our strong thrust towards conservation, which I see as one of the Club's main functions.

Over the years the emphasis seems to have been towards more "scientific" papers in the *Naturalist.* While this is seen as an important function of the journal, I would like to think that space would always be available for field data, excursion reports and club activities so that these may be available for future generations.

The Club has always completely financed (recently with the help of a much appreciated government grant) the *Victorian Naturalist* despite the fact that the amount of resources spent were, and still are, considerable. The Club still strongly supports the production of the journal whilst trying to keep costs to a minimum.

We now embark on the second hundred years of the *Victorian Naturalist.* Today the journal is in a very sound position, strongly supported by the Club and filling a needed role in society. The next hundred years will see this role ever increasing as interest in the natural world increases. It is our responsibility to make sure we leave good records of the flora and fauna as it is today, for the information and use of future members, so that they may continue the good work that was started 100 years ago.

Wendy Clark
PRESIDENT

NATIONAL MUSEUM
10 FEB 1984
VICTORIA

THE

Victorian Naturalist:

THE JOURNAL AND MAGAZINE

OF THE

Field Naturalists' Club of Victoria.

CONTENTS:

PRICE—SIXPENCE

South Melbourne:
J. C. MITCHELL, PRINTER, CLARENDON STREET.,
1884.

INTRODUCTION.

It is now three years since the Field Naturalists' Club of Victoria was first formed. The club has supplied a want, and has steadily increased in numbers until over 150 members have been enrolled. Field work has been the main object of the Society, and the enlarged cabinets, and the exhibits at meetings, testify to the activity of members in this direction, while the number of careful observers of Nature in the colony has been greatly multiplied. Many who before worked alone have been encouraged by association with workers in kindred branches, and a substantial enthusiasm has been aroused in many who had before felt no interest in the subject.

Hitherto the proceedings of the Society have appeared in the "Southern Science Record," published by Mr. J. Wing, but it is now deemed time to bring out a periodical of our own. It is hoped that a larger field of usefulness will thus be opened up, and that both members and the public will gain by the publication of a monthly record of work and results, of original papers on Victorian Botany and Zoology, and of current notices of the occurrences and habitat of interesting forms. "The Naturalist" is also intended as a medium for the exchange of specimens, and space will be given for correspondence.

Lastly, the Club has decided to prepare, and to publish in this Magazine, scientific lists of the Victorian species of animals and plants for the use of collectors. Such lists cannot be considered to be complete even in the case of the most conspicuous and best-known groups. Additions may be made from time to time; in fact, the very publication is expected to stimulate members to the discovery and recognition of new forms. Great care will be exercised to exclude all doubtful species, and as the services of some of the most active practical naturalists in the colony have been secured, it is confidently expected that the catalogues will be of value in creating that exact knowledge of specific forms which will facilitate more advanced Biological studies, and in diffusing an acquaintance with the useful and hurtful organisms of Victoria, which must be of great practical and material benefit to the community.

FIELD NATURALISTS' CLUB OF VICTORIA.

PROCEEDINGS.

The usual monthly meeting of the Club was held in the Royal Society's Hall, on Monday evening, 21st inst.—Mr. T. A. F. Leith, one of the Vice-Presidents, presiding, and, considering the inclement weather that prevailed, there was a very good attendance of members.

Correspondence.—From the Secretary of the Entomological Department of the Warren Natural History Rooms, Warren, Mass., U.S., inviting interchange of specimens. The Secretary to reply that, as the Club had no collection of its own, it could not comply with the invitation, but would endeavour to induce individual members to take up the matter.

Members Elected.—Messrs. G. R. Hill, E. Shields, T. H. Ord, A. Borthwick, and Miss K. Coghill.

Nominations for Membership.—Messrs. Clarence Hicks and P. Cecchi.

Papers Promised.—"Victorian Orchids," part 4, by C. French; continuation of "Experiences of an Old Net," by Dr. T. P. Lucas; and on a subject-unnamed, by H. Watts.

The following papers were read:—By C. French, "A few Remarks on a Curious Insect Phenomenon that Recently Occurred in his Specimen Room;" by J. F. Bailey, on "A New Species of Gordius or Hair Worm." Over this paper considerable discussion took place, principally on the subject of the life-histories of parasitic worms, the chief speakers being Messrs. Judd, Watts, J. F. Roberts, A. H. Lucas, and Dr. T. P. Lucas. Mr. Bailey mentioned that worms similar to the one shown and described by him had been found in the Yarra and the Yan Yean, and apprehended that fatality might arise to persons drinking these waters, and so absorbing the ova; but it was pointed out that it had been proved unquestionably that there was not the slightest probability of danger. He also mentioned that it was on record that a very long hair-worm had been found in a small carabus beetle, and Mr. Judd stated that he himself had taken one from the body of a spider. In the course of the discussion, Mr. Watts alluded to, and denied, the general belief that infusoria existed in the Yan Yean, as he had thoroughly satisfied himself that they do not.

The formation of a Postal Microscopical Society, similar to the one established in England, was advocated by Mr. Watts, who explained that the main object of the society was the transmission through the post, from member to member, of mounted specimens for examination, and then ultimate return to a recognised head

office. One of the boxes in use was shown by Mr. Watts, who stated that Dr. Morris, by whom it had been sent to him, desired to make it and the accompanying specimens a present to the Club after its return from Sydney. The general exhibition of specimens was an unusually interesting one. It comprised six species of Indian Ocean mollusca, viz., Spondylus tenuispinosus, S. auranteus, S. radians, Dolabella Rumphi and Umbella Indica, by J. F. Bailey; forty Humming birds, including a pair of Acestoura Helioderii, from Columbia, this being the smallest known bird, also fine specimens in flower of Spiranthes australis, Dipodium punctatum, and Cryptostylis longifolia, three orchids from the Mount Eliza district, by C. French; Birds' Eggs collected at Colac, also Sleeping Lizard from Daylesford, by T. Hyland; specimens of large Owl and Whistling Eagle, viz., Halliastur sphenurus and Athene strenura, by T. A. F. Leith; specimens of scrub from 300 miles north of Townsville, Queensland, by J. E. Prince; diseased and healthy leaves of the Coffee tree from Ceylon, by H. Watts; Kauri gum, by J. H. Matthias; Eggs of Argonauta tuberculata or Paper Nautilus, by J. H. Gatliff; thirty specimens of Coleoptera collected during the month, and specimens of Kilcunda coal, by F. G. A. Barnard; Beetles, including a new Longicorn allied to the genus Phoracantha, collected during the month by D. Best; nest of Mason Spider from North America, by G. R. Hill; Lepidoptera and Coleoptera collected since last meeting, also specimen of Polistes or Card-making Wasp and nest from Studley Park, by J. E. Dixon; and box of exotic insects and orchid in flower, Cryptostylis longifolia, by P. Dattari, who exhibited a diagram showing the relationships of the various families coming under the first section of the Coleoptera.

After a very pleasant Conversazione, the meeting separated about ten o'clock.

THE ORCHIDEÆ OF VICTORIA:

Their Habitats, with Cultural Notes.

BY C. FRENCH, BOTANIC GARDENS, MELBOURNE.

(Part I.—Read September 10th, 1883.)

Mr. President and Gentlemen of the F. N. Club of Victoria

Most of you are aware that some time since, I promised you a paper on the Terrestrial Orchids of this Colony. Since that time, however, I have thought it better to add to it the few

Epiphytic species which occur, though sparingly, in the mountainous districts of east Gippsland.

In preparing this paper, I wish it to be understood that I claim for it little or no scientific worth, as I have no desire to perpetrate any clumsy imitation of the splendid Botanic achievements of our learned and esteemed fellow-member, Sir F. Von Mueller, but simply to give you a short account of such of our native Orchids as may be met with by those who take an interest in the delightful study of nature's treasures, and also that our youthful members and others may be assisted in the recognition of the various species which they may come across during our Club excursions, which, by the way, I trust, may become more general and extended than they have hitherto been. Baron von Mueller, in one of his scientific and interesting papers, published in the S.S. Records, has told us he would wish to request that these lovely kinds of plants, of which many species are so local and so rarely flowering, should receive special attention from collectors, or to be secured even by those who are not engaged in Botanical pursuits, but could not fail to take notice of the beauty and oddness of Orchideous flowers, anywhere, even close to homesteads. I trust, therefore, that his wishes in this respect will be borne in mind by those interested, for as he further remarks, that there are yet chances of finding additional species, or at least adding some knowledge of their geographical distribution.

In looking over a collection of our native orchids, we find, as a rule, green, or various shades of blue, to be the prevailing colour; but this only holds good so far as the terrestrial species are concerned, for in most of the Epiphytal species, we find yellow and white to predominate. It is true that we cannot boast of such splendid specimens as there are to be found in the tropical forests of Java, India, South America, &c., such as the Cattleyas, Stanhopeas, Vandas, &c., or the so-called cooler species, Odontoglosum, Masdevallia, &c.; still we have in Dendrobium speciosum one of the most beautiful of the whole order, and one which, if well grown, would hold its own in any company of Orchids staged for exhibition. Again, what could be more pleasing than the appearance of our Brighton heath ground in the Orchid season, when the very soil seems gay with the tints of the various species of Caladenia, Thelymitra, Glossodia, &c., to say nothing of the more soberly-coloured species of Pterostylis, Corysanthes, Lyperanthus, &c., and other curious kinds. An excellent and popular writer has said, that "everybody likes Orchids; they command the admiration or attract the attention of all classes of flower lovers. People doat upon roses, and rightly so, their beauty and their perfume quite justify the popular allegiance. Admitting," he says, "all this, it may yet be said, in a general sense, that their attractiveness is confined to the

two qualities just mentioned, but in the case of Orchids there are so many features of interest, that each individual, we may almost say, may admire them for a different reason." The group Orchidaceæ seems to include within its limit all the attributes which make flowers attractive. Beauty of form and colour, quaintness of shape, now large now small, now mimicking in form a butterfly, in another species resembling a bird, in a third a reptile, in another presenting the aspect of some grotesque mask, flowering in winter, flowering in summer, growing in the ground, living on trees, thriving high up on the mountain side, flourishing in the moist hot woods of Java, abundant on English downs, to be found alike in the old hemisphere and in the new world, in the far north and in the extreme south.

(To be continued.)

CONTRIBUTIONS TO THE PHYTOGRAPHY OF AUSTRALIA.

By Baron Ferd. von Mueller, K.C.M.G., M.D., Ph.D., F.R.S.

Podopetalum Ormondi.—In the June number of the Melbourne Chemist, 1882, two genera of leguminous plants were defined, to one of which the name Podopetalum was given; but the record had to be limited to characteristics of leaves and flowers only, as fruits were not obtained by the discoverer, Mr. Persieh, who met this stately plant in forests near the Endeavour-river. As a species this plant remained unnamed in the periodical above quoted; but in the "Systematic Census of Australian Plants," issued at the end of 1882, p. 42, it appeared as Podopetalum Ormondi, in dedication to the honorable Francis Ormond, M.L.C., whose almost boundless munificence for raising ecclesiastic and educational institutions in this colony, was meriting a permanent token of appreciation also in botanic science. When the genus Podopetalum was first rendered descriptively known, its varied affinities to Castanospermum, Sophora and Ormosia were pointed out, as well as the difference, which separate it from these genera, so far as floral organisation is concerned; but no final systematic place could be assigned to the genus, so long as the fruit remained unknown. The latter has recently been obtained, and from the following description it will be observed, that the carpologic characteristics are almost those of Ormosia.

Pod on a stipe of rather more than half an inch length, somewhat compressed; valves coriaceous, tardily seceding, hardening through exsiccation, reaching a width of three-quarter inch more or less contracted between the seeds, dorsally undulating

becoming black outside ; pithy cross-walls imperfect or absent ; funicles thick, very short ; strophiole none ; seeds few, varying in form between roundish and quadrangular, measuring one-third to half an inch, slightly compressed ; hilum roundish-oval, only about one line long ; testa thinly crustaceous, smooth, bright scarlet ; albumen none ; embryo pale-yellowish, horny when dry ; radicle very short, next to the hilum.

To this information can now be added, that Podopetalum Ormondi forms a tree, attaining about fifty feet in height, the bark of the stem being smooth and greyish. It seems to be flowering and fruiting through many months, as both blossoms and pods were got in December.

This seems an apt opportunity to point out, that the genus Vieillardia is perhaps not combinable with Castanospermum, inasmuch as the leaves are abruptly pinnate, according to manuscript-notes received by the writer from the Abbè Montrouzier, although species with impari-pinnated and abruptly pinnated leaves are contained in Ormosia, according to Bentham and Hooker. The Veillardia grandiflora, from the isle Art near New Caledonia, must be an extremely showy plant, Montrouzier describing the flowers as numerous (-16) in a bunch, and to be each from one and a-half to two inches long.

ENTOMOLOGY.

LEPIDOPTERA OF THE MONTH,

By Dr. T. P. Lucas.

DIURNI.—The first brood of Papilio Mackayi is nearly over, and it is difficult to obtain good specimens. The second brood may be expected at the end of February or the beginning of March.

Pieris Aganippe, the larvæ of which were in December so numerous on the Wild Cherry (Exocarpus), is now emerging from the crysalis.

The Browns.—Xenia Klugii swarms everywhere, and X. Aclanta in the Ranges and near the Yarra. The first brood of Hipparchia abroma is about over. It is found in upland shady places.

The Blues.—Lycœna crinus may now be taken in shady woods at Hawthorn, about the Yarra, and in South Gippsland.

An allied form, taken by Mr. F. Spry, early in September at Brighton, has been found sparingly at Longwarry, by Mr. A. H. S. Lucas.

L. Phœbe is common everywhere by the roadsides.

L. Agricola should be taken sparingly at Brighton. I found this species recently emerged in November at Myrtleford.

Polyommatus bœticus this year is coloured more brilliantly than usual. It occurs plentifully at Cheltenham, and may be caught in the gardens of the suburbs. It has been taken once or twice near Plymouth, England, and is a common form on the continent of Europe.

Jackmenus evagorans, so abundant at Lilydale in December, is still on the wing. Mr. Dixon captured another species this month, with vermilion bars and dots on the under surface of both wings, also near Lilydale.

THE SKIPPERS.—Several are now flying. Telesto eclipsis may be taken in the Dandenong and South Gippsland ranges. T. flammeata may be looked for in the same localities.

Taractrocera papyrea is still common at Brighton in damp places.

MOTHS.—One of the Hawk Moths, Chœrocampa serofa, was taken by my boys on blackberry flowers at dusk at Healesville.

The giant Endoxylon eucalypti may still be collected on the trunks of the gum trees and on fences in the day time. On the fences, too, the mimetic Hyperchromis ocularia. I have found a form allied to the latter, conspicuous by the longitudinal in place of transverse lines on the upper surface.

Ardeis fulvo-hista may now be taken on trunks of trees or among grass about Melbourne, but more freely in the ranges. Panagra aurinaria is now coming out in upland well-timbered paddocks. Manga gigantella is to be seen on wattles or other herbage. The beautiful Cosmodes elegans may occasionally be startled out of the grass.

Plusia argentifera flies around flowers at dusk. This species and P. verticillata (Golden Y), are representative, and have the habits of very closely allied English forms.

Another form analogous to the English Drinker in habits is Savala ocellata. Swarms of the larvæ have been feeding on the grass in the Melbourne parks, and the imago is now coming out from the pupa.

Drymania dimidiata is common on fences. The larvæ often destroys cereal crops wholesale, eating all before it.

The second brood of one of our Thorn Moths, Macaria remotaria, Var. frontaria, is now to be had everywhere The males and females are so unlike, as often to be mistaken for distinct species. The females are darker and blotched, the males lighter and spotted. Another Thorn which varies remarkably in colour, adopting all shades of grey, brown and rufous, is found in copses at Boxhill and plentifully in the ranges.

Several species of Emeralds have been taken this year, some certainly undescribed. I have now eleven Victorian species in my collection, ten taken this year. Chlorochroma carenaria is the most prevalent with us.

Agarista latinus still abounds. I took a species new to Victoria and unnamed, but which had been known from Queensland, at Myrtleford.

Mr. Dixon records a specimen of the rare Gastro-phora pernicaria from near the Moe.

The season is the best I have known for Lepidoptera in the colony, owing no doubt to the unusual amount of rain. Many more notes might be added, but I will only say there is now an excellent opportunity for the prosecution of entomological studies.

CORRESPONDENCE.

Western Australian Wasps, &c.—A friend in England having written to me, asking whether a statement made at a meeting of the local Natural History Society is correct or not, viz., that Western Australian Wasps, &c., are stingless, I shall be glad to have any information about them, likewise those of the other colonies. F.G.A.B.

NOTICE.

All communications for the "Victorian Naturalist," should be sent to the Editor, A. H. S. Lucas, M.A., B.Sc., F.G.S., Anderson-street, Albert Park.

A brief history of the *Victorian Naturalist*

by BRIAN J. SMITH*

The first issue of the *Victorian Naturalist* appeared in January 1884 (a facsimile of Volume 1 Number 1 appears in this centenary issue). In the 100 years between that first issue and this one 1152 issues of the *Naturalist* have been published by the Club. At the outset the journal was seen as the principal vehicle for achieving the Club's objectives to stimulate interest in natural history and to preserve and protect Australian flora and fauna. This has remained its purpose throughout the intervening years, establishing it as Australia's premier natural history journal. Several histories have been written over the years, the most recent by J. H. Willis (1980) in the issue commemorating the centenary of the Club.

*Convener, Editorial Committee of the "Naturalist"
Senior Curator (Zoology)
Museum of Victoria

As is to be expected the contents of the 100 years of *Naturalists* have been extremely varied, covering every aspect of natural history. An analysis of these contents is outside the scope of this article, detailed listing being accessible in the Author Index compiled by Jim Baines and published in 1976, and the Subject Index compiled by Kathleen Hall and Arthur Thies and published in 1979. This article rather is intended to look at the structure and development of the magazine/journal and to pick out some of the high-lights of its first 100 years.

Physically, the *Naturalist* has remained the same size over the 100 year period, measuring 140 x 215mm. The first issue was 8 pages in length and although numbers of pages were held constant for long periods of time, there were occasional special issues published. One early special issue was Volume 4

First pictorial illustration. Vol. 6, 1889. Lithograph of the peak of Mt. Ellery copied from a photograph by Mr Walter.

Table 1. The editors of the *Victorian Naturalist* over its first 100 years. There were 12 issues per year to the end of 1975, after which there were 6 issues per year.

Editor	Period	No. of issues
A. H. S. Lucas	Jan. 1884-Dec. 1892	108
F. G. A. Barnard	Jan. 1893-Apr. 1925	388
C. Barrett	May 1925-July 1939	170
A. H. Chisholm	Aug. 1939-Apr. 1940	9
C. S. Sutton (Acting)	May 1940	1
A. H. Chisholm	June 1940-Apr. 1948	95
J. H. Willis	May 1948-Apr. 1951	36
I. M. Watson	May 1951-Dec. 1952	20
N. A. Wakefield	Jan. 1953-Apr. 1957	52
A. B. Court	May 1957-Apr. 1958	12
N. A. Wakefield	May 1958-Apr. 1964	72
J. R. Hudson	May 1964-Mar. 1966	23
G. M. Ward	Apr. 1966-Jan./Feb. 1976	118
M. J. Lester	Mar./Apr. 1976-Jan./Feb. 1977	6
R. Kent	Mar./Apr. 1977-Nov./Dec. 1978	11
B. J. Smith (Acting)	Jan./Feb. 1979	1
R. Wallis	Mar./Apr. 1979-Mar./Apr. 1980	7
M. J. Lester	May/June 1980	1
R. Wallis	July/Aug. 1980-May/June 1983	19
Editorial Committee	July/Aug. 1983-Nov./Dec. 1983	3
	Total:	1152

Number 9, January 1888, an issue of 36 pages containing the report of the excursion to King Island in November, 1887.

The disposition of the volumes is interesting:

Volume 1 — 16 monthly numbers — January 1884 to April 1885 inc.

Volume 2 to Volume 81 — 12 monthly numbers from May to April (the Club year, as the Annual Meeting is always in May).

Volume 82 — 8 monthly numbers — May to December 1965 incl.

Volume 83 to Volume 92 — 12 monthly issues per calendar year.

Volume 93 to Volume 100 — 6 bimonthly issues per calendar year.

There are also a number of "first" milestones to mention:

First article: C. French. The Orchidae of Victoria: their habitats, with cultural notes. Part I. Vol.1(1):3-5.

First list of office bearers: Officers for 1883-4. Vol.1(2) back cover.

First general advertisement: Vol.1(13) January 1885 back cover, for C. H. Mumm & Co. Reims Champagne, Alex Joske & Co., 16 Little Collins St. East.

First table of data: Vol.1(14) February 1885 in a paper by A. J. Campbell entitled 'Protection of our native birds' — table showing a list of indigenous birds protected under the Victorian Game Act.

First illustration: Vol.4(9) January 1888, Map of King Island on a separate sheet bound into the front.

First use of colour: Vol.6(1-2) May-June 1889 a fold-out map of the trip to Croajingalong by Spencer. The map had the route of the trip and the camp-sites marked in red. This feature was mentioned in a short note at the back of the volume. It may have been drawn onto each map by hand before they were glued in.

First pictorial illustration: Vol.6(1-2) May-June 1889 lithograph of the peak of Mt. Ellery copied from a photograph by Mr Walter. Four other lithographs appeared in that issue from drawings by Spencer.

First photograph: Vol.7(11): March 1891 'Tommy's Bend' in a report on a visit to Yarra Falls; one of seven photographs in that issue, all original photographs glued to sheets of paper and bound in.

First printed photograph: Vol.10(11) February 1894 'Gannetry on Cat Island' in a report of an expedition to the Furneaux Group of islands in Bass Strait.

First colour plate: Vol.49(1) May 1932 Colour variations in the Papuan "Crinoline" Fungi (*Dictyophora*) from 4 paintings by Mrs Ellis Rowan.

First photograph on the cover: Vol.76(1) May 1956 Red-necked Wallaby drinking.

Editors

The most important people involved in the continued success of the *Naturalist* were, of course, the editors. A full list of the editors, with the number of issues produced by each, is given in Table 1. From this it can be seen that 6 editors stand out as producing over 100 issues each. These are:-

F. G. A. Barnard	- 388
C. Barrett	- 170
N. A. Wakefield	- 124
G. M. Ward	- 118
A. H. S. Lucas	- 108
A. H. Chisholm	- 104

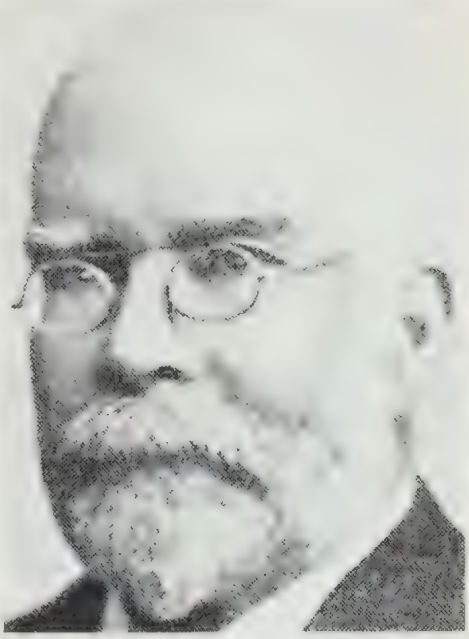
It is largely thanks to these men that the *Naturalist* has the standing it holds today. However all the editors played a vital part in furthering the aims of the Club and contributing to the knowledge of natural history in Victoria.

A. H. S. LUCAS (Editor 1884-1892)

Arthur Henry Shakespeare Lucas was born in Stratford-on-Avon in 1853. With extensive training in both the physical and natural sciences from Oxford and London he came to Melbourne in 1883 as mathematics and science master at Wesley College. He also lectured in natural sciences at Trinity, Ormond and Queens Colleges, University of Melbourne. He left Melbourne in 1892 to become headmaster at Newington College, Sydney and later science master and headmaster at Sydney Grammar School. He later held the post of Professor of Mathematics at the University of Tasmania.

Lucas joined the Club soon after his arrival in Melbourne and became the first editor of the *Naturalist* from 1884 to the time of his departure in 1892. He was also President of the Club in 1887-9. His natural history interests were wide with a keen scientific approach and he published many books and papers. A fuller account of his contribution is seen in Daley (1936).

F. G. A. BARNARD (Editor 1893-1925)



Francis George Allman Barnard, probably more than any other individual in the Club's history, gave one hundred and twenty percent for the furtherence of the Club. He was born in Kew in 1857 and with his father was a foundation member of the Club, exhibiting insects at the first meeting. He was elected to the committee in 1884 and from that time was continuously an office-bearer of the club, in one capacity or another for 42 years. He became secretary in 1884 for six years, then librarian and was appointed editor in 1893, a position he held for 32 years. He was also vice-president from 1903-5, president from 1905-7, and secretary again from 1908-10. He wrote extensively for the *Naturalist* and was particularly interested in recording Club excursions.

Barnard was a pharmacist by profession and also became involved in local government being mayor of Kew in 1920. He died in 1932. Further reference can be made to Pescott (1932).

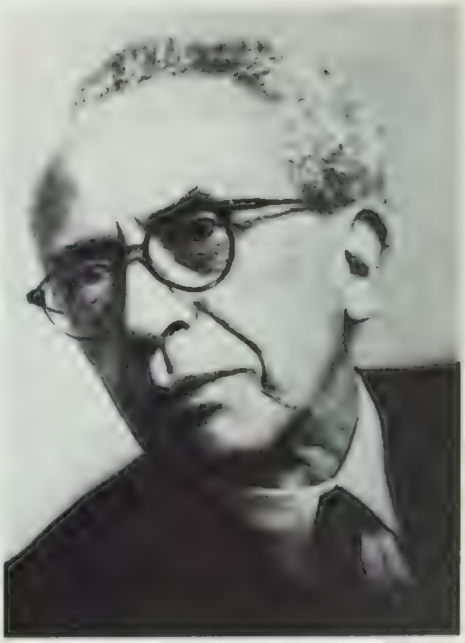
CHARLES BARRETT (Editor 1925-1939)

Charles Leslie Barrett was a naturalist, journalist and natural history author. Born in Hawthorn in 1879, he joined the Club in 1899 and at once became an active member being assistant secretary between 1904 and 1906. He was committee member 1921-23, editor 1925-1939, vice-president 1929-30, president 1930-31, and vice president again 1940-41.

He was on the literary staff of the Melbourne *Herald* for 33 years, edited the series of "Sun Nature Books" and was the author of hundreds of articles on natural history. He also edited the *Emu* for seven years. He was awarded the Australian Natural History Medallion in 1953 and died in 1959.

Further reference can be made to Colliver (1959).

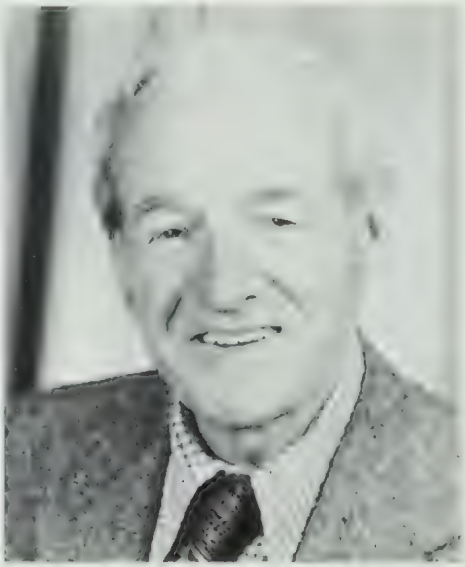
ALEC CHISHOLM (Editor 1939-1948)



Alexander Hugh Chisholm was an author and journalist with a deep love of nature. Born in Maryborough, Victoria in 1890 he early developed a love of the bush. Starting his journalist career on the Maryborough *Advertiser* he rose to edit the *Argus* and *Australasian* in Melbourne and the *Sunday Pictorial* in Sydney. He also edited *Who's Who in Australia* and the *Australian Encyclopaedia* and published many books on natural history.

A long-standing member of the Club, he was president in 1937-8 and editor from 1939 to 1948. He was the first recipient of the Australian Natural History Medallion in 1940. He put as his recreation in *Who's Who* "idling in green places" but although he loved green places he was usually far from idle. He died in 1977. For more information see Pratt (1977).

JIM WILLIS (Editor 1948-1951)



James Hamlyn Willis was born in Oakleigh in 1910, but spent ten of his boyhood years at Stanley, northern Tasmania where he became interested in native flowers and sea-shells. After matriculation he went as a trainee at the Victorian School of Forestry, Creswick (1928-30), and worked at the Daylesford Forest District. He transferred to the Botanic Gardens and National Herbarium of Victoria in 1937 where he remained for 34 years, retiring as Assistant Government Botanist and Deputy Director of the Royal Botanic Gardens.

He became a member of the Club in 1932 and throughout the past 51 years has been closely identified with Club activities. Besides editing the *Naturalist* (1948-51) he served on Council for many years and was a vice-president. Of his numerous papers (chiefly botanical and biographical) 192 have been published in the *Naturalist*. He was awarded the Australian Natural History Medallion in 1960 and the Royal Society of Victoria's silver medal for research in 1973.

INA WATSON (Editor 1951-1952)

Ina M. Watson is an ornithologist, natural history writer and lecturer, bird photographer and pioneer in conservation. Born in Carlton in 1907 and trained in accountancy and office administration, she became interested in natural history, particularly birds, in the 1930's. She joined the Club in 1944 and quickly became active in the organisation, being elected the first woman president in 1947-48. Because of her involvement in natural history and general publication, she was appointed Information Officer with the Fisheries and Game (later Wildlife) Department of Victoria in 1957 a position she held for 10 years until her retirement.

Miss Watson served as editor of the *Naturalist* from 1951-52. She was also active in the R.A.O.U., B.O.C. and other natural history clubs, holding many offices. She is an expert bird photographer, having several pictures in the Photographic Index of Australian Birds. She now lives in retirement in Portland, concentrating on oil painting.

NORMAN WAKEFIELD (Editor 1953-1957, 1958-1964)

Norman Arthur Wakefield was a bushman, naturalist, teacher, scholar and journalist. He was born in the Orbost district of East Gippsland in 1919 and showed a deep interest in all aspects of natural history and bush lore from an early age. He joined the Club in 1938 and wrote many papers mainly on botanical subjects. He was appointed editor of the *Naturalist* in 1953 a position he held until 1964 except for one year from 1957-58. In 1959 he up-graded the *Naturalist* by redesigning the cover to include a photograph, using art paper throughout and changing to a two column page format.

Wakefield started work as a school teacher, continued his scientific observations in East Gippsland and expanded his horizons in natural history by doing an M.Sc. degree in 1969. He wrote the weekly column *Naturalist's Diary* in the *Age* from 1963-65. He was tragically killed in a freak accident in 1972. Further reference can be made to Willis (1973).

ARTHUR COURT (Editor 1957-1958)

Arthur Bertram Court is a botanist whose general interest in natural history was translated into becoming a full-time professional scientist and a leader in his field. Born in 1927 he joined the Club in 1944 before starting a science degree at Melbourne University. He joined the staff of the National Herbarium in 1955, was Assistant Botanist in 1957 and rose to Senior Botanist in 1974 when he resigned to take up his present position of Officer-in-Charge of the Herbarium at the National Botanic Gardens, Canberra.

He was appointed editor of the *Naturalist* for the club year 1957-58. His own main fields of study are the taxonomy of genus *Acacia* and the history of botany and botanical collections.

DICK HUDSON (Editor 1964-1966)

He is now enjoying his retirement in Dorset, southern England.

Richard Hudson was a visitor to Melbourne for a few years between 1960 and 1967. His life-long interest in natural history, particularly birds and botany drew him to become a member of the Club and the Bird Observers Club. He was quickly recognised as a person of talent and ability and was elected editor in 1964 until just before his retirement and return to Britain in 1966.

Dick qualified as a veterinary surgeon in London in 1925 and he did research, mainly on virus diseases, in Kenya till 1947. After a short time in Britain he then worked for the Food and Agriculture Organisation of the UN in various South-east Asian countries coming to Melbourne in 1960 to work on contagious bovine pleuro-pneumonia. During his stay in Kenya he edited the Journal of the East Africa and Uganda Natural History Society.

G. M. WARD (Editor 1966-1976)

Griff Ward's interest in nature stems from visits to his grandmother's garden in Rosanna as a boy in the mid '30's. This interest was further developed by nature writers like Charles Barrett and Donald McDonald and by Crosbie Morrison's broadcasts and Wild Life magazines, all of which instilled a lasting sense of marvel.

Griff joined the Club in 1961 and when he saw the job of editor needed doing and no-one seemed to be coming forward he took the job in 1966 and kept it for 10 years. In appreciation of his magnificent achievement, in that the *Naturalist* had continued to grow and broaden in its scope and depth during this time, he was elected an honorary member of the Club in 1976.

Griff's work-a-day life revolves about problems connected with traffic management and engineering with an inner municipality of Melbourne — a profession perhaps as remote from natural history as one could be!

MADGE LESTER (Editor 1976-1977, 1980)

Margery Joan Lester is a naturalist with a special interest in botany. She joined the Club in 1953 and quickly became involved in working wherever she saw a need. She began selling publications at general meetings in 1955 as well as joining the Botany Group Committee, twice serving as its chairman. Madge has served as a Council member of the Club for many years being content to work in the background for the good of the Club.

She was elected as editor in 1976 and served for over a year. She also took on the special task of editing and coordinating the production of the special May/June 1980 issue of the *Naturalist* commemorating the Centenary of the Club. Her occupation of advertising layout artist and later free-lance typographer provided invaluable experience for her work with the *Naturalist*. Since her retirement she has been working in the Club library 2 or 3 days a week, helping to get it in order.

REUBEN KENT (Editor 1977-1978)

Reuben Kent is meteorologist and geophysicist by training and occupation and a naturalist by inclination. Born in Hobart in 1922 he came to appreciate the natural world during his childhood in north eastern Tasmania. He worked for the Bureau of Mineral Resources as a geophysicist, then as a meteorologist at the Bureau of Meteorology and finally was appointed to the staff of R.M.I.T. in 1957 to teach these subjects.

He joined the Club in 1963 to widen his interest in natural history and being one who participates rather than looks on took on the editing of the *Naturalist* in 1977 for one and a half years. Following his retirement he spends many happy hours enjoying the natural environment on a bush block in the Victorian Central Highlands.

ROB WALLIS (Editor 1979-1983)

Rob Wallis is a graduate zoologist who is currently Lecturer in Biology in the Department of Environmental Science at Victoria College — Rusden Campus. His special interest is Australian mammals, in particular their ecology, physiology and evolution. He heard the Club's need for an editor for the *Naturalist* and was elected to the position in 1979 and held it until June 1983 when pressure of work forced him to relinquish the position. During his 4 years as editor the journal increased in stature as a scientific publication. He initiated the joint sponsorship of a symposium of "the effects of introduced animals and plants in Australia" by the Club and the College, and published the papers in the *Naturalist*.

Rob represents a new breed of member and editor and is the first editor born after the Second World War. It is heartening to see that the *Naturalist* is still relevant and significant 100 years after its inception.

EDITORIAL COMMITTEE (1983)

Following the resignation of Rob Wallis halfway through 1983, no single person could be found to take on the job of editor. The solution was to form an editorial committee where the various tasks associated with the production of the *Naturalist* could be divided amongst several people. The current team (as shown in the photograph above) are: Brian Smith, Senior Curator (Zoology), Museum of Victoria, Ph.D. Zoology (bottom right); Russell Thomson, Research Assistant, Department of Microbiology, LaTrobe University, M.Sc. Genetics (bottom left); Peter Lawson, Chief Resources and Planning Officer, National Parks Service, M.Sc. Forestry (top right); Dianna McClellan, Reference Librarian for Biological and Agricultural Sciences, LaTrobe University Library, B.A. History, A.L.A.A. (top centre right); Lance Williams, Research Assistant, Department of Wildlife Ecology, Arthur Rylah Institute for Environmental Research, B.Sc. Botany and Zoology (top centre left); Joan Phillips Technical Officer, Department of Invertebrate Zoology, Museum of Victoria, B.Sc. Zoology (top left). (Photograph by Wendy Clark).

Printers

Over the years the *Naturalist* has also been well served by the various printers responsible for its production. A list of the printers is given in Table 2. Again the list is a surprisingly small one considering the time-span and is dominated by two firms:

Walker, May & Co.	- 428 issues
Brown, Prior, Anderson	- 462 issues (inc. 59 as Brown Prior)

Covers

Unfortunately there appears to be no records as to who designed the covers for the *Naturalist*. In fact, looking at the changing face of the journal over the century, one gets the impression that the cover design was largely a matter which the Club and the editor of the day left to the printer. Fourteen different designs can be seen over the 100 years, each one representing a subtle change in philosophy and the way in which the Club and the editor wanted to project themselves.

Table 2. Printers of the *Victorian Naturalist* over its first 100 years.

Printer	Address	Volumes (Numbers)	No. of issues
J. C. Mitchell	Clarendon St., S.Melb.	1(1)- 2(11)	27
Mitchell & Henderson	Clarendon St., S.Melb.	2(12)- 3(6)	7
A. H. Massina & Co.	26 Lt. Collins St. East	3(7)- 5(8)	26
Walker, May & Co.	9 Mackillop St.	5(9)-15(1)	113
Walker, May & Co.	25 Mackillop St.	15(2)-34(12)	239
Walker, May & Co.	429-431 Bourke St.	35(1)-41(4)	76
Ramsay Publishing	203-207 King St.	41(5)-43(3)	23
Horticultural Press	9 Queen St.	43(4)-46(6)	39
Mitchell & Casey	23 Tattersall's Lane	46(7)-47(12)	18
Brown, Prior & Co.	430 Lt. Bourke St.	48(1)-52(11)	59
Brown, Prior, Anderson	430 Lt. Bourke St.	52(12)-83(9)	366
Brown, Prior, Anderson	5 Evans St., Burwood	83(10)-86(10)	37
Jenkin Buxton & Co.	1 Abbotsford St., W. Melb.	86(11)-100(6)	122
		Total:	1152

Cover 1. Vol.1(1)-Vol.3(6). The original cover, stating that the publication is the Journal and Magazine of the Club.

Cover 2. Vol.3(7)-Vol.5(8). A change of printer sees a different and more elaborate design with an ornate border and different type-face. A disclaimer for the reliability of the facts and opinions in the journal is added.

Cover 3. Vol.5(9)-Vol.8(4). Another change is made with the change of printer, to an even more ornate border and another type-face. This time the definite article in the journal title is promoted to have equal prominence. The price is also put in much larger type and the name of the agents for Europe put onto the front cover.

Cover 4. Vol.8(5)-Vol.18(12). No clear indication is given why a change should be made to this design, as it was not a time of change of either the editor or the printer. The basic layout remains the same but the editor's name and the actual publication date appear on the cover. This design lasted for over 11 years, the third longest period for a cover.

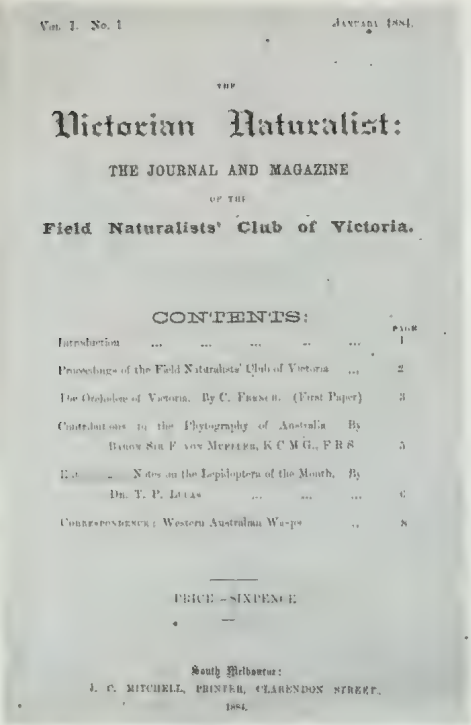
Cover 5. Vol.19(1)-Vol.22(6). The type used for the main title was changed to a more modern, though still ornate, type-face. The editor was also referred to as Hon. Editor.

Cover 6. Vol.22(7)-Vol.41(4). This only differs from the previous design by the addition of the first Club emblem, the gastropod shell *Niotha pyrrhus*. This design was held for the second longest period, over 19 years.

Cover 7. Vol.41(5)-Vol.44(8). A change of printer brought about another change both of border design and of type-face. The title is made more prominent and the type-face is a more modern one with little ornamentation. The price has also changed from 6d. to 1/- by the introduction of this design.

Cover 8. Vol.44(9)-Vol.47(12). Another change in printer has another change in design with the introduction of the new Club emblem the flower *Correa reflexa* and the border reduced to a single line. The contents are also printed much larger and more prominently and some of the other information such as the date of publication is reduced in size.

Cover 9. Vol.48(1)-Vol.67(12). This design had the longest life of any of the covers being used with only minor changes for over 20 years. Here the border is dispensed with, the definite article in the title is again reduced giving prominence to the *Victorian Naturalist*. The whole design is simplified and has a much less cluttered appearance.



Vol. I. No. 1 JANUARY 1884.

THE

Victorian Naturalist:

THE JOURNAL AND MAGAZINE

OF THE

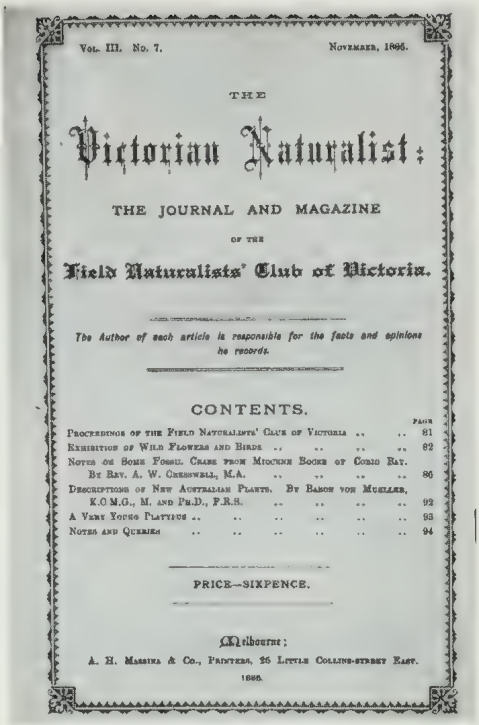
Field Naturalists' Club of Victoria.

CONTENTS:

PRICE—SIXPENCE

South Melbourne:
J. C. MITCHELL, PRINTER, CLARENDON STREET.
1884.

Cover 1. 1884-1886



Vol. III. No. 7. NOVEMBER, 1886.

THE

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THE JOURNAL AND MAGAZINE

OF THE

Field Naturalists' Club of Victoria.

The Author of each article is responsible for the facts and opinions he records.

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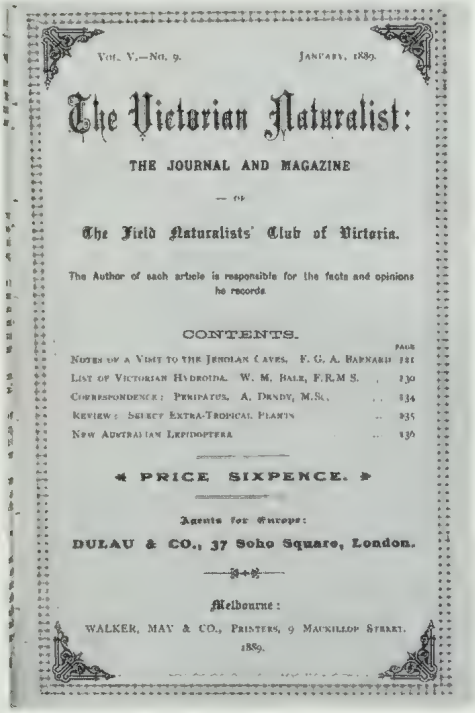
Cover 2. 1886-1888



Vol. V.—No. 9. JANUARY, 1889.

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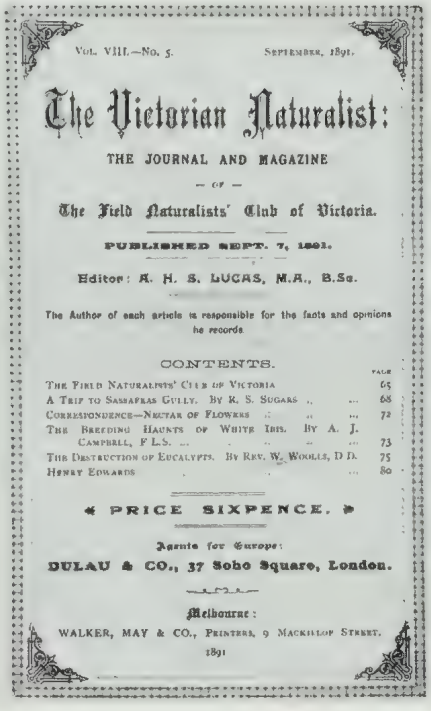
1889.

Cover 3. 1889-1891



Vol. VIII.—No. 5. SEPTEMBER, 1891.

The Victorian Naturalist:

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— OF —

The Field Naturalists' Club of Victoria.

PUBLISHED SEPT. 7, 1891.

Editor: A. H. S. LUCAS, M.A., B.Sc.

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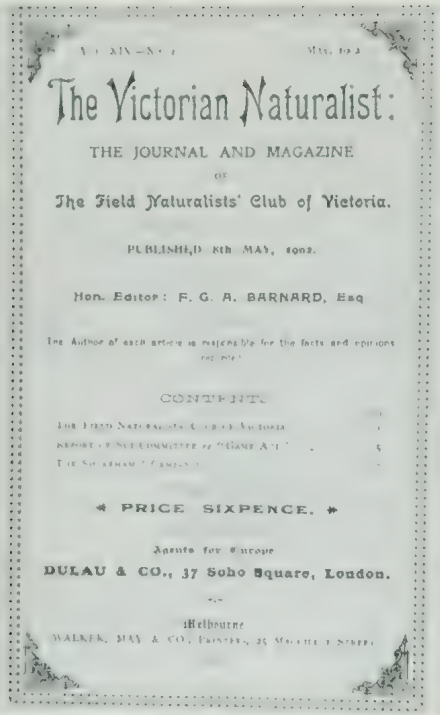
1891

Cover 4. 1891-1902



The Victorian Naturalist:

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OF

The Field Naturalists' Club of Victoria.

PUBLISHED 8th MAY, 1902.

Hon. Editor: F. G. A. BARNARD, Esq

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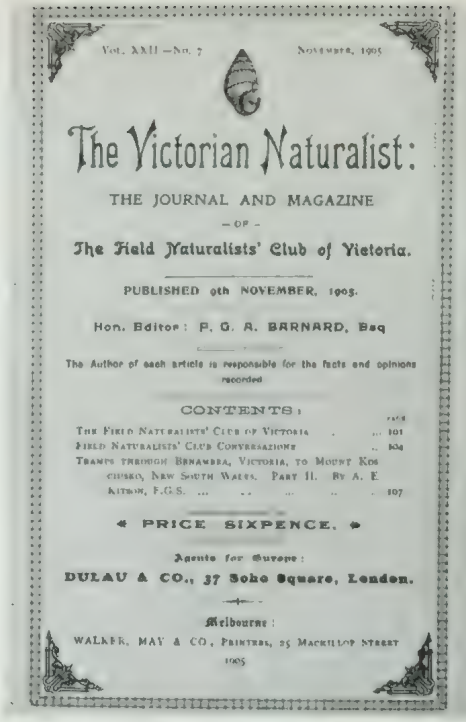

Vol. XXII.—No. 7 November, 1905

The Victorian Naturalist:

THE JOURNAL AND MAGAZINE

— OF —

The Field Naturalists' Club of Victoria.

PUBLISHED 9th NOVEMBER, 1905.

Hon. Editor: P. G. A. BARNARD, Esq

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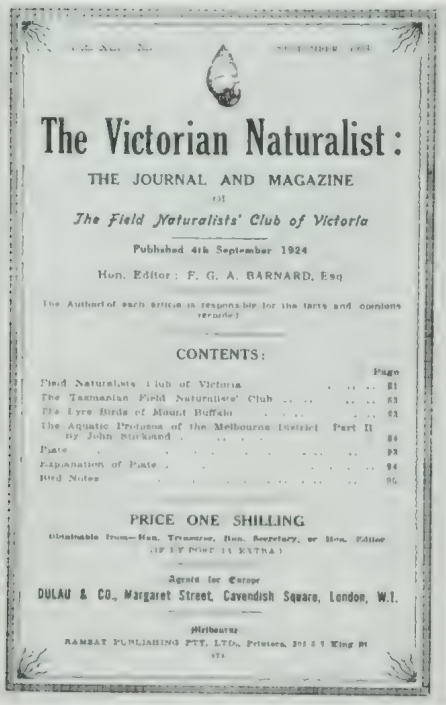
1905

Cover 6. 1905-1924



The Victorian Naturalist:

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Published 4th September 1924

Hon. Editor: F. G. A. BARNARD, Esq

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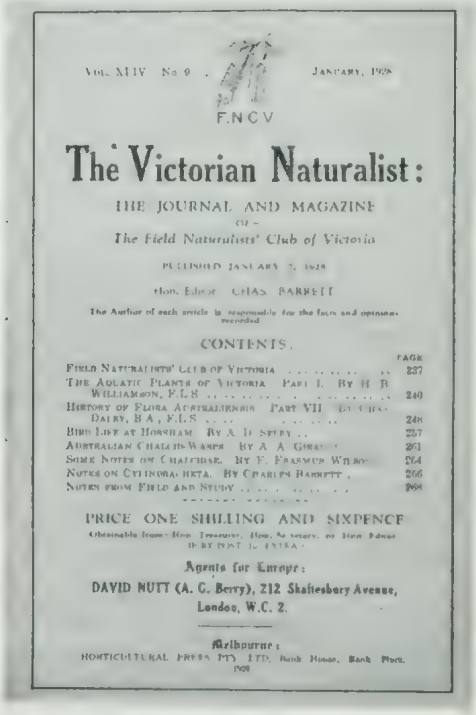
Cover 7. 1924-1927



Vol. XLV No. 9 January, 1929

F.N.C.V.

The Victorian Naturalist:

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— OF —

The Field Naturalists' Club of Victoria

PUBLISHED JANUARY 7, 1929

Hon. Editor CHAS. BARRETT

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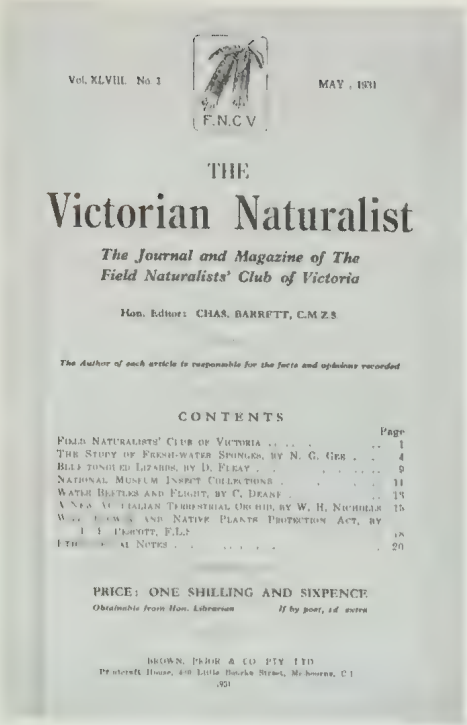
HORTICULTURAL PRESS PTY. LTD. Bank House, Bank Place.

1929

Cover 8. 1928-1931



Vol. XLVIII. No 1 MAY , 1931

F.N.C.V

THE

Victorian Naturalist

The Journal and Magazine of The Field Naturalists' Club of Victoria

Hon. Editor: CHAS. BARRETT, C.M.Z.S.

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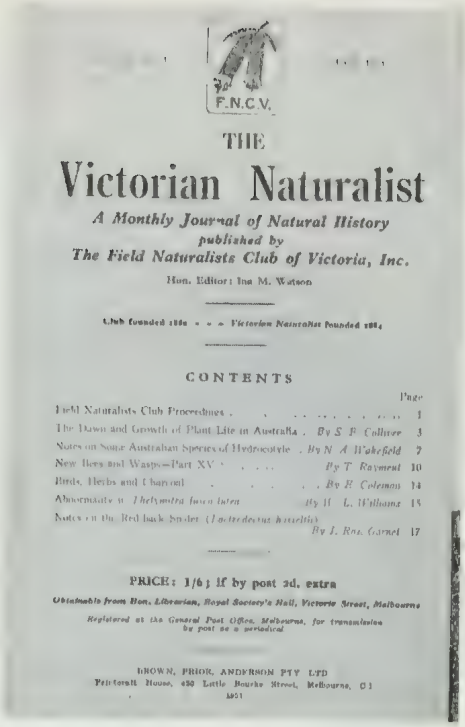
1931

Cover 9. 1931-1951



F.N.C.V.

THE

Victorian Naturalist

A Monthly Journal of Natural History published by The Field Naturalists Club of Victoria, Inc.

Hon. Editor: Ina M. Watson

Club founded 1880 . . . *Victorian Naturalist* founded 1884

CONTENTS

PRICE: 1/6; If by post 2d. extra

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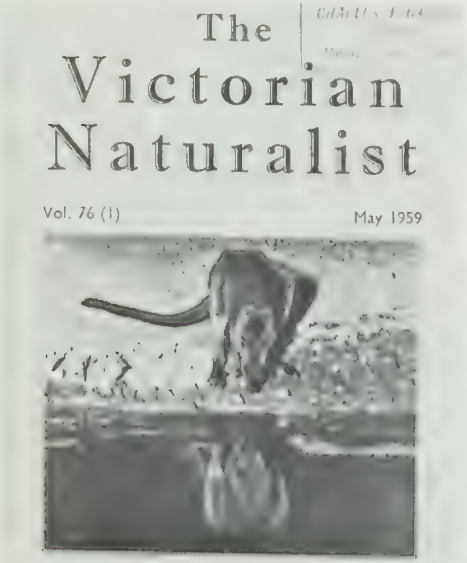
BROWN, PRIOR, ANDERSON PTY. LTD.
Printers'st House, 430 Little Bourke Street, Melbourne, C.1
1951

Cover 10. 1951-1959



The Victorian Naturalist

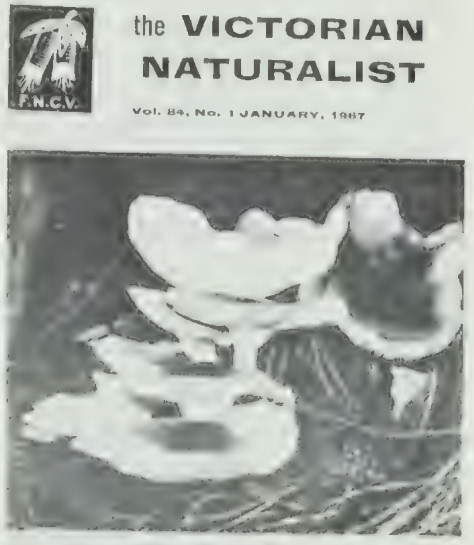
Vol. 76 (1) May 1959

Published by the

Field Naturalists Society of Victoria

26

Cover 11. 1959-1966



F.N.C.V.

the VICTORIAN NATURALIST

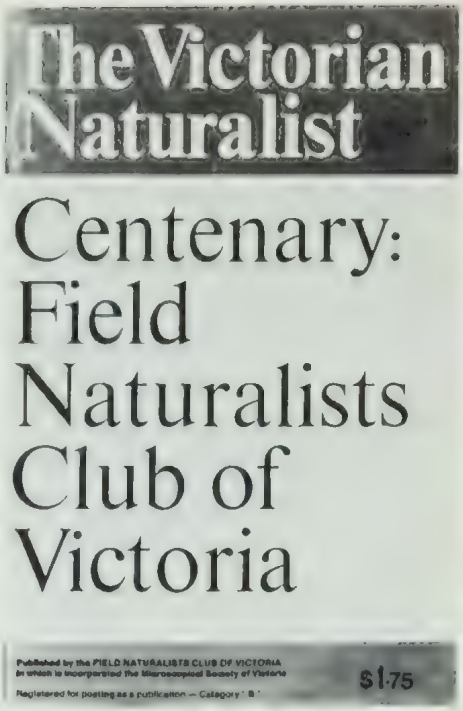
Vol. 84, No. 1 JANUARY, 1967

NATURALISTS CLUB OF VICTORIA

35 cents

Cover 12. 1967-1970

Cover 13, 1971-1980



Cover 14, 1980-1983

Cover 10. Vol.68(1)-Vol.75(12). This design reflects what one must suppose was a basic shift in philosophy within the Club about the *Naturalist*. Until the introduction of this design all the covers had described the *Naturalist* as "The Journal and Magazine of the F.N.C.V." Here this is changed to "A Monthly Journal of Natural History published by the F.N.C.V. Inc."

Cover 11. Vol.76(1)-Vol.83(12). This design is by far the most radical change for the *Naturalist* with the introduction of a photograph on the cover and the relegation of the contents list to inside the journal. This cover also announces that it is published by the Field Naturalists Society of Victoria, a mistake that was rectified the following month.

Cover 12. Vol.84(1)-Vol.87(12). A further modernization in design with the photograph extended to the full width of the cover, the title printed in bold clear capitals and the Club emblem returned to the cover. However the design of the emblem was somewhat "stylized" causing a variety of comments amongst members.

Cover 13. Vol.88(1)-Vol.97(2). A printed colour is used for the first time on the cover this colour being changed for each volume. The colour is used to print the title in large white letters and the Club emblem is moved to the bottom of the design.

Cover 14. Vol.97(3)-Vol.100(6). This is the current design in which colour is still used to denote the volume but the form of the white lettering forming the title has been enlarged, also returning to prominence the definite article in the title. The Club emblem has again been taken off the cover and the other printed information on the cover has been restricted to a narrow strip of colour at the bottom.

The price of the *Naturalist* has also risen with printing and postage costs over the years. From 1884 to 1923 the

cost per issue was 6d. Within four years it had trebled to 1/6, but was reduced to 1/- during the Depression, 1932, and held at this level for 15 years before rising again to 1/6 in 1947. Since then the costs have spiralled, 2/- in 1951, 2/6 in 1952, 3/6 in 1965 changing to 35c in 1966, 45c in 1968, 75c in 1975, $1.20 in 1976, $1.75 in 1979 and $2.20 today.

Acknowledgements

I would like to thank all the past editors who are still alive for their assistance in supplying biographical information and a photograph; also to Mrs Wakefield for supplying a photograph of her late husband. Thanks are also due to Dr Parnaby and Mrs Lucy Edwards of Queens College, University of Melbourne for the picture of Lucas, to the Herald and Weekly Times Ltd. for the picture of Chisholm and Mr F. S. Colliver for the picture of Barrett. I am grateful to the library staff of the Division of Natural History of the Museum of Victoria, to Frank Coffa and Vincent Haveaux, Photography Department, Museum of Victoria, to Lyn Anderson for typing the manuscript and to Betty Argo and Vivienne Smith who assisted in extracting data.

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Subscriptions

Subscription rates for 1984 have been increased. This has been necessary because the rate is based on the cost of production and mailing of *The Victorian Naturalist*, to which is added a membership fee of $3, which is applicable to both partners in a joint membership. A higher rate applies to Metropolitan members who have the opportunity of attending meetings. Council hopes that by making a considerable increase in the rates now it will be possible to absorb increasing costs without having to raise the subscription rates again in the near future.

Council draws members' attention to the following points:

Subscriptions cover the calendar year from January to December.

Persons joining the Club in the second half of the year may pay a 6 month or 18 month subscription. Anyone paying a full year's subscription in the second half of the year will be regarded as having paid for the **current year** and will receive back issues of that volume of *The Victorian Naturalist*.

Subscriptions do **not** run from mid-year to mid-year.

In order to cut costs Council has discontinued the practice of sending individual reminder notices.

Members who fail to renew their subscriptions by 15th May will have their names automatically removed from the mailing list.

Prompt payment greatly facilitates the Club's operations.

Congratulations to Dr Elizabeth Turner, who was awarded an Honorary LL.D. from Melbourne University on 10th December, 1983.

WAYS OF SEEING NATURE: Attitudes to Nature in the *Victorian Naturalist*, 1884-1982.

By Elwyn Watkins*

Introduction

This essay examines attitudes to nature among the Field Naturalists Club of Victoria (F.N.C.V.). The investigation focuses on the club's journal, the *Victorian Naturalist*, as a record of the club's activities and attitudes. Both the club and the journal were formed in the 1880s, and have continued to function until today.

The review of the *Victorian Naturalist* undertaken here spans almost one hundred years, from 1884 to 1982. For practical reasons, the study does not provide constant detail. Instead, it concentrates on one year in every ten for the duration of the journal, starting, as the journal did, in January, 1884 and finishing with 1982. A multiple-choice questionnaire was designed to focus attention on specific points relevant to attitudes towards nature. In an attempt to minimize subjective judgement, the questionnaire was applied to each article in the eleven sampled years of the *Victorian Naturalist*.

Monthly meetings are also recorded in the *Victorian Naturalist*. These records indicate the issues considered important by club members, and register the members' responses. They guided the qualitative evaluation of members' attitudes to nature.

The main advantage of this method is that broad trends can be easily recognised when they are sustained over several decades. Fads that disappear in a few years are automatically eliminated. At most, they create an erratic response in one sampled year, which can be disregarded. Only changes that are retained for three or more samples, spanning twenty-one years, are considered significant.

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The standardized questionnaire allows the diverse years of the survey to be compared on a consistent basis. Although complete objectivity is never possible, an attempt has been made to minimize subjectivity for the quantitative data. The records of monthly meetings provide qualitative information to complement the numerical data generated by the questionnaire. In total, 398 articles and the records of 118 monthly meetings were examined.

However, the method also has some disadvantages. The researcher's attitudes changed during the course of the survey and slightly altered the response to the questionnaire. Another problem was that not all magazines were readily available. For these reasons, and because only one year in ten is analysed, the results should be interpreted as guidelines rather than precise positions.

Domination of nature emerges as a central theme in the *Victorian Naturalist*. The style of domination, however, changes. Concepts of exploitation and stewardship appear as strong influences on attitudes to nature.

The Role of the F.N.C.V. in Society

The early members of the F.N.C.V. saw themselves providing a valuable contribution to scientific knowledge by collecting natural history specimens. The first volume of the *Victorian Naturalist* summarizes the aims of the club:

> "It is now three years since the Field Naturalists' Club of Victoria was formed. The club has supplied a want, and has steadily increased in numbers until over 150 members have been enrolled. Field work has been the main object of the Society, and the enlarged cabinets, and the exhibits at meetings, testify to the activity of members in this direction, while the number of careful observers of Nature in the colony has been

Group photograph on excursion to King Island in 1887, though unfortunately none are identified. Photo from FNCV archives.

greatly multiplied. Many who before worked alone have been encouraged by association with workers in kindred branches, and a substantial enthusiasm has been aroused in many who had before felt no interest in the subject."

The stated principal role of the club was to encourage collecting for scientific purposes. But ancilliary to the role of scientist-collector was a social goal. The club provided a supporting network for naturalists, generating a sense of collaboration among workers.

"Socially, as well as scientifically, such an institution as ours must act beneficially, as it brings into closer and more intimate union those who are already held together by the tie of affection for some scientific pursuit."

An extension of this bond was the desire to recruit new members to the noble study of Nature, — with a capital "N" in 1884, indicating the esteem with which it was regarded. The missionary aspect of this drive was still apparent in 1904:

"Our responsibility, as an association of naturalists, is to help, and inspire if possible, all those who come amongst us".

Yet by 1934, the missionary zeal had mellowed to educational fervour. Speaking of the Wild Nature Show, an annual event conducted for most of the club's existence, the president reports that "the educational value of these shows is widely recognized".

The second world war created shortages that severely cramped the club's traditional methods, but the energies of members were rapidly redeployed:

"No Wild Nature Show was held this year, nor does it seem possible to stage one for the duration of the war, but we look forward to days when the Club can again bring Natural History before the general public in this popular way . . .

"Owing to the fact that many of our kindred societies are in recess, we were not asked to assist so much at displays, but on the other hand several of our members have been prominent in lecturing to the Forces and other organizations."

First, photograph: Vol. 7, 1891. Photograph of 'Tommy's Bend' in a report on a visit to Yarra Falls.

The aims of the organization had altered from primarily scientific pursuits to the promotion of social activities convincing people of the value of nature. The club provided an encouraging centre from which naturalists could embark on their chosen projects.

"Natural history societies contributed to the welfare of the community by bringing members regularly together to share observations and express opinions."

The shift in emphasis from a knowledge-based scientific society to a human-oriented organization can still be seen in the stated aims of 1982:

"Objects: To stimulate interest in natural history and to preserve and protect Australian fauna and flora. Members include beginners as well as experienced naturalists."

The club still revolves around the accumulation and dissemination of scientific information. But it is now departing from the role of dispassionate scientist-collector and approaching an activist stand. The objectives of 1982 specifically refer to an obligation to promote conservation. The methods of achieving the scientific goals accept that people's knowledge and experience must be considered before effective scientific communication can eventuate.

This more recent approach may be due in part to the amateur status of many club members. It is true that many eminent scientists have been associated with the club, but it has never been a professional institution. A description of members in 1884 may be just as valid today:

"Most of us are engaged in occupations which confine us within doors, and the mere ramble in the country for a few hours is as good for the body as it is for the mind of the intelligent observer."

The role of amateurs was referred to again in 1904:

"Few of our numbers have been grounded in a systematic training in the natural sciences, and . . . most, perforce of circumstances, make the study of natural history but an incident in a busy life."

Even in 1944, a report refers to "fellow-members, who seem to be drawn from all ranks of society."

The role of professionals may have been stronger in the early years. Evans (1982) shows that in 1894 approximately twelve members held tertiary qualifications while by 1900 the number was climbing steeply to around thirty-four members. From my reading of the early journals it seems that these people often held important positions in the club, as committee members and presidents, and so could direct the club to become a scientific institution.

Branagan (1972) shows that the proliferation of scientific societies in the 1880s and 1890s had largely combined into national scientific institutions by the 1920s. The F.N.C.V. did not join this move. It is in the 1920s, then, that the F.N.C.V. clearly emerges as an independent amateur organization.

The Role of the Journal in the F.N.C.V.

The *Victorian Naturalist* was an instrument of communication, playing an important role for amateur scientists. Details of monthly discussions, weekend excursions and scientific papers were presented to a wide audience through the journal.

Monthly meetings were recorded, with details of who had spoken and what specimens were displayed. This information could be valuable to naturalists working in isolation. By 1964, the details were omitted, but the issues discussed at meetings were still recorded.

Excursions were a prominent feature of the journal. Reports of Saturday or Sunday excursions were presented verbally at meetings, and then details were published in the magazine. Often, these reports would include lists of species seen in the area, providing valuable data for people unable to attend. Records were written not just for the present, but with concern for the future, so that later researchers would have data for comparison. The journal also contained snippets of news and book reviews of interest to naturalists.

The bulk of the journal was usually occupied by papers. Originally, these were read to the club before publication. But gradually, papers appeared that had not been read. Sometimes the papers were broadly based and chatty, reporting on the marvels of trips to far away places like the Mallee or north Queensland. Some reported on experiments. Most recorded observations of nature around Melbourne.

The *Victorian Naturalist* has always been highly regarded within the club that produces it. During the journal's first year, the club secretary reported that "it will no doubt shortly be the recognised journal of the natural history of the Colony". Enthusiasm still reigned after ten years: "Although a great expense to the Club, it has amply justified its existence". This sentiment has remained through the history of the journal.

The importance of the journal can be gauged from the proportion of club funds allocated to its production. Fig. 1 shows that usually over 50% of the

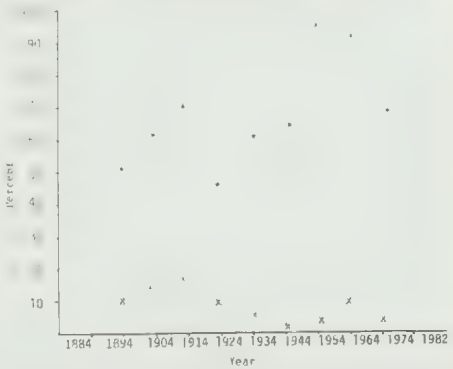

Fig. 1. The financial significance of the *Victorian Naturalist* to the F.N.C.V. (* Cost of the journal as a percentage of the net expenditure of the club; x Income from the journal as a percentage of the net income from the club). Calculations based on annual financial statements published in the *Victorian Naturalist*. Figures were not published in the annual reports for 1884 and 1982. Numbers are rounded to the nearest 5%.

Year	Percentage of journal income derived from advertisements.
1884	—
1894	—
1904	25
1914	35
1924	80
1934	10
1944	—
1954	80
1964	55
1974	15
1982	—

Fig. 2. The contribution of advertisements to the gross income gained from the *Victorian Naturalist*. Information was not available for 1884, 1894, 1944 and 1982.

club's expenditure was spent on producing and distributing the journal. Yet less than 20% of the club's income was derived from it. The magazine cost the club far more than it earned. Even when advertisements comprised 80% of journal revenue in 1924 and 1954 (Fig. 2), the journal ran at a substantial loss.

Who paid for the *Victorian Naturalist* to run at a loss? Over 60% of the club's income was from membership subscriptions. (Fig. 3) The two exceptions in the survey are 1924 and 1934.

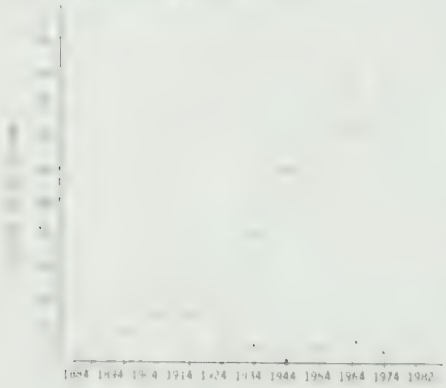

Fig. 3. Percentage of total club income from membership fees and from the *Victorian Naturalists*. (o Membership fees; x Gross income from *Victorian Naturalist*.). Source: Annual Reports published in the *Victorian Naturalist*

In 1924, the club had two major financial commitments: publishing a book, *Census of Australian Plants*, and conducting a Wild-flower Exhibition. Both these projects involved substantial expenses and major incomes. The net profit from the ventures, though, was less than the money gained from membership fees. Similarly, in 1934 the Wild Nature Exhibition generated slightly more income than membership subscriptions, but the net profit was lower. Membership fees, then were the principal source of club funds. Members subsidized their journal through their fees, proving that the existence of the *Victorian Naturalist* transcended economic motives. Communication among naturalists was an important goal for the club, a goal achieved through the club's journal.

Eurocentrism

The way the naturalists saw the Australian landscape was strongly influenced by their cultural background. Early naturalists showed a European bias when they regarded Australian flora and fauna as aberrant, and the life of Europe as normal, an attitude Seddon (1982) calls eurocentrism. A variation of this is an article on liverworts published in the *Victorian Naturalist* of 1914. Because particular liverworts are alive in Australia and only present as fossils in England, Australia is seen as backward.

One of the major eurocentric concepts brought to the new colony was the idea of order in nature. It seems all societies have a concept of order. The idea that the white settlers brought with them, though, was a philosophical development peculiar to Europe. It was, and still is, widely accepted as an immutable law of nature.

Seddon claims that the hierarchy of European plant taxonomy is based on Aristotelian logic, and the lateral division of families and genera derives from

Early Club excursion — probably in 1920's. No other information is available and any member knowing its source is asked to contact the author. Photo from FNCV archives.

Linnaeus' collection of plant material, a collection in which two thirds of all genera are European. He concludes that:

"Claims by later botanists that the taxonomic stability of many of these families and genera is evidence that they have a 'natural' validity ignores the realities of long cultural reinforcement".

The field naturalists from the outset assumed that nature was ordered to European specifications. Their primary goal was to collect unusual specimens to fill the gaps in their knowledge of nature's order. The president's address of 1904 shows how little they questioned their view of their environment:

"In studying natural history objects one should examine them not alone to satisfy one's own curiosity, but in a definite and systematic manner; then and only then may he justly claim to be a scientific worker, and assuredly he will find that by this means he will accumulate a mass of accurate information that will afford himself benefit and make knowledge for others."

The "definitive and systematic manner" was, of course, the European method of observing and recording specimens, following systems of classification already established in Europe. Alternative classifications were not considered.

This view was prevalent among the field naturalists for many years. In 1944, the Rev. Rupp, a highly respected orchidologist, found it necessary to remind the club that:

"a species is an artificial unit of classification invented by man; Nature pays no heed to specific rank"

Few people appear to have listened to his opinion. During the same year, a general question night of the club revealed one member who stated that the British classification of the lyrebird described to a "natural" family — a view that was not challenged. Similarly, another member referred to the "lower orders" to which the platypus belonged, confusing a classificatory system with an

Francis G. A. Barnard, photograph from Vol. 51, 1934. Taken about 1914 on a Club excursion.

evolutionary one. Again, the view was accepted and recorded as accurate.

These examples also illustrate an increasing independent speculation among Melbourne's naturalists, although they had not rejected the European concept of order. Another example is increased political awareness among scientists. Macleod (1982) maintains that the consolidation of metropolitan and colonial science through the formation of the Australasian Association for the Advancement of Science in 1888 strengthened loyalty to British science on one hand and brought colonial science from the periphery where it had served a collecting function, into the mainstream of European intellectual discussion, allowing for intellectual activity in colonies such as Victoria.

The emergence of an independent Australian identity is also commented on by Bolton (1976). Describing the role of historians in Australia, he states that from 1834 to 1883, they:

> "Aimed to present a view of Australia which would reinforce its power to attract capital, migration, or favourable political attention.
>
> Most of them wrote for British publishers and British readers."

Yet by the time the field naturalists formed their club, the situation was changing.

> "The generation of the 1870s and 1880s, those decades when the number of the colonial-born began to draw ahead of the migrant population, were highly self-conscious of the emergence of a distinct Australian type, and often sought explanations in climatic and environmental factors."

This does not mean that Australians suddenly were able to cast aside a slavish obedience to British ideas. It means, rather, that Australian scientists were freer to theorize independently about their collections and observations.

The concept of superiority that the early naturalists brought with them from Europe also influenced their view of Australia. They saw themselves as masters of an untamed land. Their superiority was the justification for exploiting the country, farming and mining to make huge short-term profits and then returning "home" to England.

When the Field Naturalists Club started in 1880, a substantial proportion of the white population had been born in Australia, as Bolton notes. But many of them still regarded England as their home, even though they had never been there. Articles in the *Victorian Naturalist* frequently refer to Victoria as "the colony" and look to England for the "proper" way of doing things. The structure of the club followed the form of similar clubs in England, as described by Allen (1978). Meetings adopt a standard business agenda, provide an informed speaker and finish with an exhibition and conversation. This format existed in England in 1750, and is still popular in Victoria today.

Overseas visitors at meetings received greater formal acknowledgement than local or interstate guests who might have been competent naturalists. Local members who travelled overseas were seen at meetings as speaking with greater authority when they returned to Australia. The reverence to England in particular as the "homeland" or the "mother-country", the centre of learning and of propriety continued well into this century. With it remained an attitude of British superiority over a primitive land.

Part of the primitive land was the aborigines. One theme in the articles of the *Victorian Naturalist* was the study of aboriginal society. Mulvaney (1971) contends that this area in Australia was dominated by eurocentric ideas. An example is Baldwin Spencer, who became a prominent anthropologist after his appointment to the chair of biology at Melbourne University in 1887. He remained active until the 1920s, and was an influential member of the F.N.C.V. Mulvaney describes the close network of

anthropologists to which Spencer belonged, a network centred on Tylor in England. Spencer's work with the Australian aborigines was a reflection of the racial attitudes of Tylor's Britain. Tylor's influence, through Spencer, spread to later generations of Australian anthropologists.

One of the values of English scientists like Tylor was exemplified in the belief that no worthwhile culture existed before the arrival of British missionaries. Settlers, coming from a superior English background, were entitled to disregard the previous inhabitants and claim the land for their own use. A typical celebration of British superiority was given by the president of the F.N.C.V. in 1944, showing that eurocentrism was with us then.

"It was a momentous day for Australians when the ship *Endeavour* hove-to in Botany Bay on April 28th, 1770. Accompanying Captain Cook was a party of skilled naturalists headed by Mr (later Sir) Joseph Banks . . . As the first settlers arrived native pastures were located and a rapid development in the pastoral industry followed . . . The pastoral pioneers were sound practical men, thinkers in their own line of research, and to-day we must realize the value of their endeavours. These men and women may be styled our first naturalists."

Again, in 1964, a typical article refers to British colonization as "early settlement", as though the aborigines did not exist.

When the aborigines were recognised, it was as scientific curiosities. A scientific paper of 1934 describes how the heads of tribal Aborigines were shaved and covered with plaster to create casts that could be examined by anthropologists back at the museum. The methods of study may have changed since 1934, but the attitudes have not.

The eurocentrism that started with Captain Cook is still with us. The land, and the Aborigines as part of the land, are still viewed from the position of conquerors.

Naturalists now consider themselves equal with British naturalists. The culture of the Australian naturalists is essentially the same as that in England. Central concepts such as cultural superiority and natural order are usually not questioned. Seddon (1982) states that only in the last ten years has this attitude received any significant challenge.

Domination of Nature

The survey shows that domination of nature has been present throughout the hundred years of the journal. This domination is exemplified in two main forms: exploitation and stewardship.

Authors in the *Victorian Naturalist* from 1884 until 1934 display a dominant attitude of exploitation. This statement is based on the results of my survey, illustrated in Fig. 4. In this period, well over 60 percent of articles, and usually over 80 percent, register exploitation of the land as a worthwhile goal. By comparison, other attitudes do not exceed 20 percent. Naturalists in Melbourne until 1934, then, were primarily concerned with exploiting the land.

Exploitation was justified for economic gain and for intellectual pursuits. Authors in 1914 spoke of the right

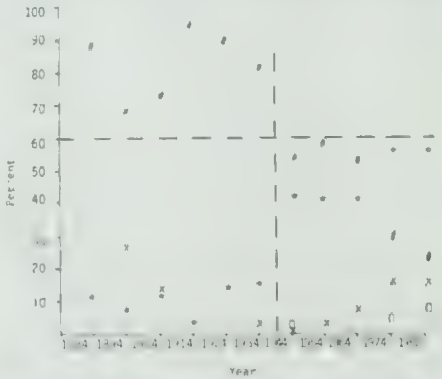

Fig. 4. The attitudes towards nature of authors in the *Victorian Naturalist*.

KEY: # People dominate nature and are justified in exploiting it.
* Stewardship: people are dominant and responsible.
o People are part of nature
x No clear response.

to collect specimens and the right to experiment with non-human lifeforms. A specific example of this thinking included trapping and dissecting a kangaroo to discover its reproductive system. The author assumed that symmetry was essential because of the order of things, meaning, in the context of the paper, God's immutable order. He accepted that European zoologists were correct in their theories of the kangaroo and so produced a report supporting those theories. His conclusion conflicted with his own evidence and with the stated views of bushmen.

Another instance of European values dominating the Victorian naturalists is an article on grass wrens which casually mentions that birds were shot for their skins. Presumably, these skins were added to the collection of the shooter, and any surplus was traded or sold to other collectors, a standard practice for the international scientific community of the time. Exploitation of Australian wildlife and wilderness, whether for economic or intellectual profit, was a right implicit in the belief of European Superiority.

A dramatic shift in attitudes occurred in 1944. From 1944 to 1964, exploitation was no longer the dominant attitude in the journal. Acceptance of exploitation ranged from 50 to 60 percent, while stewardship dominated 40 to 50 percent of articles. The sampling technique used in the survey means these figures should be treated as being very close. The two views probably held equal weight amongst the naturalists. The right to knowledge was still a strong theme in the articles, but there was a growing awareness of the need to conserve the environment.

A plea to conserve mangrove swamps for scientific interest was published in 1944. The stewardship of the swamps in this case was to benefit people. The life forms of the swamp were not seen as having an intrinsic right to live, so the attitude was still one of domination. By 1954, the move to conservation was becoming more complex. Authors were

First printed photograph: Vol. 10, 1894. 'Gannetry on Cat Island' in a report on an expedition to the Furneaux Group.

torn between differing views. The quest for knowledge runs through one article beside an awe of the beauty and balance in nature. In another, the struggle between conservation and tourism is discussed, but not resolved — and it still hasn't been resolved in discussions today. The general survey shows that there was no clearly dominant attitude across the articles at this time.

Inspection of individual articles shows that each author might have held several conflicting views at the one time.

The concept of stewardship remained popular in 1974 and 1982, with 50 to 60 percent dominance. Exploitation, on the other hand, dropped to the 20 to 30 percent range. There is a strong suggestion that exploitation was a less popular view, but the qualitative nature of the survey means quantitative results must be interpreted as guidelines only. Exploitation was certainly present, particularly in scientific experiments. Here, again, the quest for knowledge was seen as more important than any right that nature might have to an independent existence and thus must be seen as a form of domination. So, for example, one article reported that a field study of rats necessitated removing the competition — an unfortunate circumstance for the competition. Part of the ecosystem was studied through the destruction of another part. The ecosystem was not viewed as a whole.

Even allowing for the imprecision of the data, two complementary trends appear. The first is a large decline in articles showing the view that people are justified in exploiting nature. It is difficult to say when this trend began. 1894 and 1904 provide low numbers, perhaps because the state was suffering first from a severe economic depression and then from a major drought. Under these conditions, people who had taken for granted the bounty and recuperative powers of nature were forced to change their minds. Yet by 1914, exploitation reached 96 percent, its highest level. The response to failures of nature was to rely on a technological fix, the ability of science to overcome the inadequacies of nature. Perhaps the major influence was the development of a science of land management, and a widespread knowledge of ecological concepts. People were not readily seen as a factor influencing the ecological balance, or if they were, their influence was usually seen as good. Only one article at this time suggested that the action of the white settlers was causing the extinction of native fauna. Scientific methods were readily applied to a nature separate from people, a nature that people could attempt to view dispassionately and objectively.

It was not until after the second world war that any significant change occurred in this attitude. Perhaps the extent of the war made people realise how vulnerable the world was, that nature would not always regenerate unless it was helped. This shock followed soon after the drought and depression of the 1930s, when the land was again not obeying the whip of the white masters. Slowly a changing awareness emerged. The naturalists accepted that they must act to preserve aspects of their lives that they wished to retain. Gradually, the concept of stewardship replaced exploitation. People were still seen as separate from nature, and not bound by the ecological concepts that apply to other lifeforms. This time, however, people had a responsibility to manage the environment to ensure its survival, rather than extracting profits and then abandoning the area. By 1974, when conservation groups were lobbying throughout the country, exploitation had become a minor view, and stewardship dominated the articles of the *Victorian Naturalist*.

One lesson in this survey is the almost total absence of the concept that people are part of nature, subject to the same ecological forces as other animals. Seven

Year	Local	State	National	Inter-National	Number of Issues
1884	✓	✓			2
1894	✓	✓	✓		4
1904	✓	✓	✓		7
1914	✓	✓		✓	6
1924	✓	✓		✓	4
1934	✓	✓			6
1944		✓	✓		5
1954	✓	✓		✓	8
1964		✓	✓	✓	5
1974	✓	✓			4
1982	✓	✓	?	?	9

Fig. 5. The scope of conservation issues addressed by the F.N.C.V.

of the 398 articles surveyed might be interpreted as saying that people are part of nature.

On closer examination, these articles refer to only part of our existence as being natural. People as a whole are still considered separate from nature.

Exploitation and stewardship are the major attitudes towards nature revealed in this survey of the *Victorian Naturalist*. Both these views accept that people are superior to nature and therefore dominate nature. The transition from exploitation to stewardship reflects an increasing acceptance that people also have a responsibility towards nature.

Year	Lobby Govern.	Legal Action	Fund Raising
1884	✓		
1894	✓		
1904	✓	✓	
1914	✓		
1924	✓		
1934	✓		
1944	✓		
1954	✓		✓
1964	✓		
1974	✓		
1982	✓		✓

Fig. 6. Methods employed by the F.N.C.V. to promote specific conservation issues.

Conservation

The responsibility inherent in stewardship can be exemplified by the naturalists concern for conservation. The extent of the global conservation movement in the 1960s was certainly new, but naturalists had been aware of the need to protect nature since the inception of the club. Up to nine specific conservation issues were acted on by the club in each year of the survey. Their significance ranges from local matters, such as asking the South Melbourne city council to select native trees for road plantations, through to acts of international importance.

Fig. 5 indicates how the scope of conservation awareness has varied in the club. Only two conservation problems were tackled in 1884. The tone of the journal shows greater interest in acquiring knowledge than in preserving nature. For instance, the September journal devotes more space to the need for a handbook of Victorian plants than to the "ruthless destruction of trees and shrubs" at Studley Park with the result that "natural history objects were becoming very scarce." The club sent a deputation of five eminent men to "wait on the Minister of Lands, and draw his attention to the matter". Within a month, the minister agreed to prosecute any vandals, and the club was satisfied.

The other conservation issue of 1884 was the Game Act Amendment Bill, which restricted the use of swivel guns. The club petitioned parliament in support of the bill. In both instances, the club adopted political lobbying as a method of dealing with the situation. It became the standard method for club action.

Fig. 6 shows how heavily the naturalists relied on lobbying the government to achieve their goals. In 1884, the issues were minor, but gradually they grew in number and significance. The method of handling them remained constant.

The naturalists' conservation interests had expanded to the national level by 1894. The decision of the Western Australian government to create a national park of 160,000 acres near Perth was greeted with enthusiasm. The Horn expedition to Central Australia was also applauded. It was not seen as an act of domination, but as a noble quest for scientific information. The need to collect specimens was not questioned. Awareness of conservation was not as acute in 1894 as it is today. The club had not yet lobbied for prolonged periods, nor had it initiated a major conservation project.

This changed in 1904. The club embarked on lengthy discussions with the Department of Lands to have Malleson's Glen in Gippsland zoned a flora and fauna reserve. Their action

General interest article, from Vol. 51, 1934. 'Is it a worm? Young Bronze Cuckoo', photograph by A. H. Chisholm.

FNCV Excursion to Myers Creek, near Mt. St. Leonard, Healesville district on 25 November 1911. Party of 8 includes Dr Sutton (extreme right), Mr Reg Kelly and Dr Shaw (leaders), Messrs Barnard (second from left), Hardy, Kershaw, Mowling, Pitcher and McGowan, but no ladies or boys are mentioned. (See Vol. 28:190.1912). Photographed from J. Willis library by Bruce Fuhrer.

was only partly successful. Timber felling was halted in the glen, but the wildlife still had to fend for itself. The club was not yet adept at lobbying, but it was improving.

Land management first became a clear issue in 1904. A government proposal to lease river frontages to farmers was opposed by the club on the basis that if timber were removed for pasture, the flora would alter and the fauna be driven away. The increased run-off would muddy the streams and affect the fish. This is a complicated argument to present to government. It indicates greater knowledge and self-confidence among the naturalists. The club was emerging as a worthy institution in the conservation arena.

It was not required to fight the battle alone. The journal mentions two new societies in 1904, the Field Trial and Game Protection Society and the National Forests Protection League. The emergence of these societies indicates the presence of stewardship among naturalists. It may not have been the main view, but it was an active one. F.N.C.V. members were urged to subscribe to the new clubs, to provide money and numbers for lobbying government. Conservation was generating considerable interest at the turn of the century, possibly as a response to the first major drought in the colony's history.

After the conservation groups were established, their view expanded even further. The field naturalists, with other clubs, petitioned to legislate for protection of insectivorous and other birds in 1914. The Plumage Bill was passed and the field naturalists appeared a persuasive conservation force.

Retaining a primary interest in local and state conservation issues, the club continued to lobby for national and international causes. Only occasionally did they use alternative methods to achieve their aims. One instance of legal action involved a club member, Charles French Jr., who prosecuted a person for shooting magpie larks in 1904. The prosecution was initiated on the club's

behalf, and later received club approval.

Fund raising occurred in 1954, with a call for donations to buy the house of a famous but deceased naturalist for use as a museum. The final example is a reference to the club's Kinglake property in 1982. The rates were expensive and so a fund-raising group was to be formed. The club was sponsoring its own conservation project.

The lobbying of 1974 provided a new twist for an old theme. Conservation studies were widespread because of the popular conservation movement of the 'sixties and early 'seventies. In 1974, the Land Conservation Council published reports on three areas: Melbourne, East Gippsland and the Mallee. Each time a report became available, the *Victorian Naturalist* supplied information on how to obtain a copy and solicited club members to make their own submissions on the reports to government.

The club was now so large that general meetings were impractical. A conservation group was formed within the club in 1974 symbolizing the importance of conservation to the club. A conservation co-ordinator was appointed to the club in 1982. He considered that his job was "to funnel members ideas to the proper quarters and to funnel back their reception". On the evening of his appointment, he read "a letter protesting against forest logging in the Grampians", a stand reminiscent of at least two previous occasions when the club had fought milling operations.

Conservation has been a strong theme among field naturalists since the journal started in 1884. The initial projects were hesitant, but by 1904 the club displayed knowledge, conscience and determination. The change in attitudes from exploitation to stewardship after the second world war did not result in a sudden conservation drive. The club was already active in conservation. The expansion in conservation efforts in the community resulted in a specialist group within the club dealing with the relevant literature. The principal action taken by the club was to lobby the appropriate section of government. The club had been consistent in this approach throughout the survey. For the field naturalists, conservation was more than a fad of the 'sixties. It was central to the club's purpose, providing the principal objective for the Council of 1982.

Conclusion

The central theme of this survey has been to examine the attitudes to nature held by the field naturalists in Melbourne. In 1884, the predominant attitude was one of exploitation of nature, although the concept of stewardship was present. Gradually, these two views exchanged places in the articles written by the naturalists. After the second world war, stewardship came to the fore, but exploitation remained a significant if lesser force.

This change is a matter of degree rather than kind. Exploitation and stewardship both assume that people dominate nature. Very rarely in the survey are people seen as part of nature. The question is rather how much do we dominate, and does this power entail any responsibilities. Exploitation assumes that whatever people do, nature will continue as before. This was perhaps based on the belief that God made Europeans superior to any other lifeform and God would take care of them. Stewardship accepts that nature does not always return to its former state without the assistance of the people who altered it.

The difference between exploitation and stewardship is large when seen from this perspective. It is not surprising, then, that change was gradual.

The early naturalists saw Australia from a European perspective. They considered themselves and their values superior to any colonial experience. Exploitation of Australia was a right implicit in their superiority. Australian

Full page drawings from Vol. 51, 1934. Various forms of the Sun Orchid *Thelymitra aristata* by W. H. Nicholls.

An example of a modern conservation issue. Orange-bellied Parrot (*Neophema chrystogaster*). Photograph by Cyril Loubshate. From Vol. 97, 1980.

peculiarities only slowly filtered through to intellectual circles, to challenge concepts of European superiority and European order in nature. Part of the challenge to European superiority was the recognition that people who dominate nature are to some extent responsible for it. This pattern of stewardship developed slowly.

The emergence of stewardship after the second world war suggests that the naturalists would become active in conservation programs at that time. This did not happen. The naturalists had always been involved in conservation. The initial programs were relatively minor matters of local or state interest. By 1894 the club was investigating national problems, and international issues were acted on in 1914.

The interest in national and international affairs was secondary to the persistent efforts in local and state issues. The club consistently lobbied the government for change within the state, sometimes on its own but with the

emergence of conservation groups in 1904, the club was often one of many championing particular causes to the government.

The relative importance of stewardship did not affect the club's efforts for conservation. The pattern of protecting nature was established early within the club, in an atmosphere of European superiority. Political lobbying remained at a conservative level even when the responsibility to nature was readily accepted.

The F.N.C.V., then, has always held a range of attitudes towards nature. Initially, in an environment that justified exploitation, stewardship was still a strong minority position, as shown by the example of conservation. Today, stewardship is the main stand, although exploitation is still present. A theme common to both positions is that people dominate nature. What has changed in articles written by naturalists is the extent to which people are responsible for nature.

Acknowledgements

Thanks are due to my project supervisor, Dr Wade Chambers and to Dr Lyndsay Farrell, David Turnbull and Terry Stokes for comments on the manuscript. Professor Weston Bate and Jane Carolan added to the context of the project from their area of Australian Studies. Special thanks go to Dr Brian Smith for allowing me access to the archives of the Field Naturalists Club of Victoria, and to Trevor Pescott for lending me early volumes of the *Victorian Naturalist* from his private collection. Thanks also go to Janene Hughes who typed the manuscript.

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(Editor's note: This paper is an extract from an M.A. Preliminary thesis submitted to Deakin University. Full copies of the thesis are lodged at the University.)

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It is pleasing that many people think sufficiently highly of the work of the FNCV and the standing of "*The Victorian Naturalist*" to take the trouble to add a donation to their subscription. Each year about this time, as subscriptions arrive in large numbers, many contain a donation for which we are very grateful. It is not possible to thank individually those of you who have done so, so please accept this as a personal thank you for your efforts in defraying the costs of running the Club.

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THE

VICTORIAN NATURALIST:

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OF THE

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INDEX TO VICTORIAN NATURALIST.

VOL. I.

FNCV Secretaries 1880-1984

The secretaries of the Club have, over the years, been the main workers and co-ordinators of the Council. The presidents were listed in the Centenary Issue for the Club in 1980. However, I don't think the names of the secretaries have ever been listed.

D. Best — 1880-4
F. G. A. Barnard — 1884-9
D. Le Souef — 1889-92
H. P. C. Ashworth — 1892-7
C. French — 1897-8
G. Coghill — 1898-1901
J. A. Kershaw — 1901-5
J. F. Haase — 1905-6
J. A. Kershaw — 1906-8
F. G. A Barnard — 1908-10
A. D. Hardy — 1910-13
J. R. Tovey — 1913-15
J. G. O'Donoghue — 1915-17
E. S. Anthony — 1917-19
P. C. Morrison — 1919-21
C. Oke — 1921-6
L. L. Hodgson — 1926-31
A. E. Rodda — 1931-2
A. J. Swaby — 1932-3
L. W. Cooper — 1933-4
F. S. Colliver — 1934-48
H. Preston — 1948-50
F. Lewis — 1950-6
E. H. Coghill — 1956-66
D. Lee — 1966-72
R. H. Riordan — 1972-74
G. Johnson — 1974-6
vacant — 1976-8
W. Clark — 1978-81
vacant — 1981-2
S. Houghton — 1982-4

Some other people may have served as acting secretaries for very short periods; these are not listed.

Profiles of the Current President and Secretary

Wendy Clark — President

Born in 1954, Wendy is the youngest President the Club has ever had and brings to the job a wealth of enthusiasm and youthful vigor. Though young in years she is not short on experience of administration in naturalist clubs.

She joined the Hawthorn Juniors at the age of 12 in 1966, became Treasurer in 1971, and served as President for three years from 1975. She came to the senior Club via the Mammal Survey and Field Survey Groups in 1972, becoming Secretary of MSG from 1976-77 and Chairman from 1977-81. She joined the Council of the Club in 1977, was elected Secretary from 1978-81 (a period including the Club's centenary year) and was elected President in 1981.

Though her primary interests are spiders and mammals, she is interested and knowledgeable over a wide field of natural history. Wendy has increased the Club's consciousness in conservation matters and done a lot to revitalise the General Meetings.

She is a technical assistant in Industrial Chemistry working on detergents. She is also a very keen photographer.

Sheila Houghton — Secretary

Sheila has been a member of the Club since 1972. She is interested in a wide range of natural history with a special interest in botany, especially fungi. Being an active participator, she joined the Council in 1981 and was elected Secretary in 1982.

Since her election she has completely reorganised the Club's filing system and has speeded up and made more efficient the running of Council meetings and the Club. Seemingly routine matters, such as prompt and clear minutes and up-to-date correspondence, as well as providing agendas for all meetings, have immeasurably helped club efficiency. She was also largely instrumental in transferring the club membership and address records over to a computer system, again increasing efficiency and saving the Club money.

Sheila is Librarian at Huntingdale High School and fortunately has enough time and energy left over to give outstanding service to the Club too.

FIELD NATURALISTS CLUB OF VICTORIA

Reports of recent activities

General Meeting
Monday, 12th December

Honorary Membership was awarded to Mr W. H. Fulton, from Koondrook, who has completed 40 years membership. He was stationed in Melbourne with the Army in 1943 when he was sponsored for membership of the Club by Ivo Hammett and H. R. Reeves.

Speaker for the evening was Dr Ian Bayly, Reader in Zoology from Monash University. Dr Bayly spoke on plankton research he carried out in Antarctica two years ago at the Davis Antarctic Base. More specifically his work was centred around Burton Lake in the Vestfold Hills — these hills, incidentally, are an 'ice-free oasis', i.e. there is no big load of continental ice on the ground surface.

Burton Lake is a meromictic (two-layered) lake in which the lower layer is saline and the upper layer freshwater. Such a lake is formed through uplifting of the earth's crust such that a large expanse of sea is broken up into isolated lakes. Then, through snowmelts an upper layer of freshwater forms. Burton Lake is frozen for approximately ten and a half months of the year, the ice thickness on the surface being about 1.6 metres. Below this is the layer of freshwater in which there is abundant oxygen and below this a layer in which there is no oxygen and high concentrations of sulphide and ammonia.

The plankton are collected by pumping them out through a narrow hole cut in the ice whereby they are caught in a fine net. They are pumped from an accurately known depth and volume of water — the latter allows the densities of the various plankton species to be determined.

In this study Dr Bayly and his co-worker isolated four components of the plankton system viz. (i) phytoplankton and bacteric which are fed upon by (ii) a copepod *(Drepanopus)* which is in turn preyed upon by (iii) a medusa *(Rathkea)* and (iv) a ctenophore. In the period of his study Dr Bayly found that the copepod became less common over a span of several months due to predation, until the new generations emerged.

An important finding of this current research was the discovery of significant numbers of the medusa just below the boundary between the two layers of water. This phenomenon occurred within the period of 24 hours sunlight when the light was at its weakest, and according to the textbooks, this shouldn't happen. One possible explanation is that the medusae are going to feed on things (e.g. detritus) that are slowed down in the lower layer because of the greater density.

Dr Bayly finished his talk with a further discussion of some the ingenious sampling techniques employed in his research.

Exhibits: As a further postscript to the Foraminiferan article which appeared in the last Naturalist there was on display under the low power microscope approximately 1000 flagellates which had emerged from the 200 or so pieces of a *Shepheardella* which had broken up. A separate display illustrated two types of hydroids, one with straight tentacles and another with knobs on the ends of its tentacles.

Under the high power microscope were exhibited specimens of *Closterium*, a very small crescent-shaped desmid.

Other exhibits were:—

— the leaf-eating beetle *Paropsis* and its eggs on the twig of a eucalypt species.

— a live potted specimen of Broom Rape. This plant, rare in Victoria, is parasitic and kills those plants around it.

— an unidentified liverwort from

Kirth's Kiln, Gembrook, and the fungi *Podoscypha petalloides* and *Clitocybe infundibuliformis* from East Metcalf.
— an unidentified green and black cicada.
— a 'photo of a naturalist' which was an exhibit from a successful FNCV display held at Camberwell library, and another photograph, of Arthur Henry Shakespeare Lucas, first editor of the Victorian Naturalist. This photograph, lifted out of a group picture can be seen elsewhere in this issue.

Nature Notes: One member reported observing a male lyrebird gliding across the flooded Big River twice a day for a week and performing on both sides of the river.

General Meeting
Monday, 9th January

Honorary Membership was awarded to Mr Andy Blackburn, on completion of 40 years membership. While in Papua New Guinea in 1942 he was fascinated by some of the plant forms he found growing in the jungle. He sent sketches and specimens to the Herbarium in Melbourne whereupon Jim Willis communicated with him and shortly made him a member.

Being a member's night the position of speaker was available to any member wishing to talk on any topic/s of natural history interest. Andy Blackburn presented 'Slides from a naturalist's album' in which he touched on a varied assortment of subjects. With Andy's particular interest in flower photography there were many slides of plants from all parts of Australia including the Sterling Ranges, Nullabor Plain, the Olgas, Victorian Alps and Anglesea, where he photographed some 22 species of orchids in the last season. He currently has a project going in which he is endeavouring to photograph the flora of Keilor plains. One of the last refuges for the remaining flora in this region is the areas immediately adjacent to railway lines — Andy has found rare orchids growing in such places.

There were also slides from a number of FNCV excursions, one to W.A. and another to Lord Howe and Norfolk Islands. The vegetation of these islands has sufferred greatly at the hands of man and his introductions such as pigs, goats and rabbits. He pointed out that Norfolk Island was settled only three years after Sydney and that today there is very little natural vegetation left. Other photographs included interesting geological formations, an 8,000 year-old Aboriginal skeleton ('Green Gully man'), and one of a 30 minute time-lapse study of the stars around the South Celestial Pole.

Dr Brian Smith talked of a trip he made to the 8th International Malacological Conference in Budapest. Attracting some 200 Malacologists from around the world this was the first time such a conference had been held behind the 'Iron Curtain'. He showed slides of Budapest and its surrounds including the local National Parks which he remarked were well cared for. More in relation to malacology Dr Smith reported that the edible snail *Helix pomatia* is becoming rare in many European countries.

He later went on to London and Paris, and had an interesting experience at Moscow when on the way home. A short scheduled stop to change planes became a two-day stay in which time they were kept under guard and taken on bus tours around Moscow — never being allowed out of the bus!

Exhibits: Some of the slides donated by Mrs Genery were displayed:
— the comb jelly *Pleurobrachia*
— little seahorses
— the radiolarian *Polycystina barbados*
— a medusa of the freshwater jellyfish *Craspedacusta* sp. from the Yarra River.

Another member brought in fly larvae *(Eristalis* sp, Family Syrphidae) which had come up from his toilet. He noted

that it had taken 40 minutes for the larvae to die in pure alcohol.

From the Mammal Survey Group's Christmas Camp to the Snowy Ranges came a number of exhibits including a rock with purple colouration which is possibly due to manganese. Eight species of bat were caught at this camp, including the White-striped bat, which was caught on trip lines strung 4-6 inches above a pond, and the Tasmanian Pipistrelle which was brought back alive and displayed at the meeting. The bat, in temporary residence at one member's house, eats a large quantity of flies each night as well as moths and raw meat. From the same camp also came the report that the wild flowers are presently in profusion in the high country.

Also on show was a longicorn beetle from Queensland, two types of cicada (bladder cicada and black cicadas), and a wasp.

Another exhibit was of several rocks from New Zealand, one from the shore of Lake Wa, and another from the vicinity of a glacier.

Nature Notes: One birdwatching member had the following observations:—

— a number of Latham's (Japanese) Snipe in a large clump of teatree within Nepean State Park.

— Red-rumped Parrots at Studley Park feeding on grass seeds at times only a few feet from the observer

— a pair of Grey Teal with 10 chicks on a dam near Nepean State Park.

There was a report of a wasp's mud nest in a laundry window which contained a number of anaesthetised small green spiders in whose bodies the wasp grubs hatched and fed upon. It was remarked that the spiders found in wasp nests always seem to be green.

Two Song thrushes were seen in Camberwell and there was a query as to whether this species is making a comeback after a previous decline due to the effects of snail poison.

Blackbirds were reported to be feeding on the petals of Feijoa flowers which are evidently delicious. In their endeavours to pull the petals off the birds rub against the anthers and aid cross-pollination of the flowers.

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(Continued from inside front cover)

GROUP MEETINGS

FNCV members are invited to attend any Group Meeting

Day Group — Third Thursday.

Thursday, 16th February. Yarra River Walk. Meet at east end of Hawthorn Bridge. (Melway 2H J7) 11.30 a.m. Leader: J. Wilson, 836 3521.

Thursday, 15th March. Hampton. Meet at Hampton Station 11.30 a.m. Leader: D. McInnes, 211 2427.

Thursday, 19th April. Studley Park (if sufficient people interested). Leader: E. Gillespie, 578 1879.

At the National Herbarium, Birdwood Avenue, South Yarra at 8.00 p.m.

Botany Group — Second Thursday.

Thursday, 9th February. East Gippsland — John Blyth.

Thursday, 8th March. Tundra — Mary Boery.

Thursday, 5th April. Orchids — Mrs Margaret Dacy. NOTE CHANGE OF DATE.

Geology Group — First Wednesday

Wednesday, 7th March. The ruins of Pompei — Mr and Mrs Love.

Wednesday, 4th April. The Afar triangle Mrs G. Love.

Mammal Survey Group — First Tuesday

Tuesday, 7th February. The legality and morality of the Kangaroo industry — Dr Peter Rawlinson.

Tuesday, 6th March. Member's night (AGM).

Tuesday, 3rd April. To be announced.

Microscopy Group — Third Wednesday

Wednesday, 15th February. Collecting pond life and observation by Mr D. Wentworth.

Wednesday, 21st March. Diatoms. Mr K. Blaze, TO BE HELD AT MELBOURNE UNIVERSITY.

Wednesday, 18th April. Aspects of cytology — Dr E. Peters.

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Field Naturalists Club of Victoria

Established 1880

Registered Office: FNCV, c - National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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Botany: Mr PETER CARWARDINE, 2a Victoria Road, Malvern, 3144 (509 0622 B.H. 211 8958 A.H.)

Day Group: Mrs E. L. GILLESPIE, 23 Wild Cherry Road, Carnegie 3163 (578 1879)

Geology: Miss HELEN BARTOSZEWICZ, 23 Henry Street, Kensington, 3031 (376 1706 A.H.)

Mammal Survey: Mr LANCE WILLIAMS, 29 Erica Crescent, Heathmont, 3135 (879 1962 A.H.)

Microscopical: Mrs ELSIE GRAHAM, 147 Broadway, Reservoir, 3073 (469 2509)

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Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

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GENERAL MEETINGS

Monday, 16th April, 8.00 p.m.

David Cameron. The Errinundra Plateau. NOTE CHANGE OF DATE AND SPEAKER.

Monday, 14th May, 8.00 p.m.

Annual General Meeting. Presidential Address: "Techniques for Photographing Wildlife" — Miss Wendy Clark.

Monday, 4th June, 8.00 p.m.

Dr E. Newman. An illustrated talk on current forest entomology in Victoria. NOTE CHANGE OF DATE.

New Members — March/April General Meetings

Metropolitan

Anne Bedford, P.O. Box 88, Diamond Ck. 3089.
Petra Wegener, 19 Torrington St., Canterbury. 3126.
Barbara Taylor, 43 Gordon St., Clifton Hill. 3068.
Peter Chance, Spring Hill, North Rd., Langwarrin. 3910.
Margaret Drummond, 62 Wellman St., Box Hill Sth. 3128.

Country

Mr O. Brewster, 15 Scarborough St., Inverloch. 3996.
Ian Lunt, 15 Brookes Cres., Macedon. 3440.
Miss R. Sanders, 1 Turner St., Wangaratta. 3677.

Joint

Muriel Bland, 87 Kerferd St., East Malvern.
Ira Barker, C/o Post Office, Healesville.
Mrs J. Bechervaise, 185 Roslyn Rd., Belmont.
Mrs A. J. Grant, 12 Selwyn St., Hackett, A.C.T. 2602.
Bill & Moira Paterson, 41 Medina Rd., Glen Waverley. 3150.
Allan & Patricia McMeikin, 26 Tennyson St., Highett. 3190.
Dr J. T. & Mrs P. J. Faragher, 28 Parlington St., Canterbury. 3126.
Ann & Brian Tindall, 31 Barnard Gve., Nth. Kew. 3101.
Bronwyn Myers, 7 Clovelly Ave., Glenroy. 3046.

Student (Full Time)

Tom May, 48 Williams Rd., Blackburn. 3130.
Tarmo Raadik, 269 Balwyn Rd., North Balwyn. 3104.
Ruth Lawrence, Geography Dept. University of Melbourne, Parkville. 3052.

FNCV EXCURSIONS

Friday 20th-Wednesday 25th April. Easter-Anzac Day. Mildura, with day excursions to Hattah Lakes, Walls of China, etc. The coach will leave at 8.00 a.m. from Flinders St., by the Gas and Fuel Building on Friday 20th. Bring a picnic lunch. Accommodation has been booked on a dinner, bed and breakfast basis at Boulevard motel. Cost for coach and accommodation is $220.00. A deposit of fifty dollars should be paid when booking and the balance by the general meeting on the 16th April. Book with the excursion secretary Marie Allender.

April 20th-25th (Easter/Anzac Day) Combined group camp to East Gippsland. The campsite will be situated on a property ("Malinns") on the Bonang Highway beside Martin Creek, 0.4 km north of the 53 km post from Orbost. Turn left at Old Mill track. Camp signs will be posted. We will be especially interested in the flora and fauna of the Ellery block (Mount Ellery area) and there will be the opportunity for walks in this area. Note that this camp was previously advertised as Rodger river.

Contact Lance Williams ph. 879 1962.

Sunday, 6th May. Kalorama. The coach will leave Batman Avenue at 9.30 a.m., fare $8.00. Bring a picnic lunch.

Sunday, 3rd June. Arthur Rylah Institute, 123 Brown St., Heidelberg. This is an open day at the Institute and there will be guided tours, films, etc. Bring a picnic lunch and meet at Heidelberg Station at 10.45 a.m. The train leaves Melbourne at 10.15 a.m., arrives 10.40 a.m. To reach the Institute cross Burgundy Road, and walk two blocks up Stradbroke Avenue to Brown Street.

Friday evening 29th June-Sunday, 1st July. Dunolly area. Camp out led by John Milligan (557 3509).

September 15th-28th. N.S.W. This proposed excursion would be, tentatively, Deniliquin, West Wyalong, Coonabarabran (3 nights visiting the Warrumbungles), Narrabri (2 nights visiting the Kaputar National Park), Tamworth, Singleton, Blue Mountains (2 nights), Canberra, Albury, Melbourne.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Saturday, 28th April. Anglesea. Autumn orchids.
Saturday, 26th May. Upper Pakenham. Fungi, etc.
Saturday, 30th June. "Fungi" led by Bruce Fuhrer.

Mammal Survey Group

April 20th-25th (Easter/Anzac Day) Martin Creek, East Gippsland (NOT Rodger River as previously planned).

May 12th-13th. Big River.

June 9th-11th. (Queens Birthday weekend). Whale-watching weekend at Warrnambool.

(continued inside back cover)

F.N.C.V.

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Cover Illustration: Estuary of Grassy Creek, Otway coast, after Ash Wednesday fires of 1983. See article on page 92.

The Eastern Grey Squirrel, *Sciurus carolinensis*, in Victoria

By J. H. Seebeck*

Introduction

Just when, and by whom, the American Eastern Grey Squirrel, *Sciurus carolinensis* Gmelin was introduced into Melbourne is not known. Many species of plants and animals were brought to this country during the latter part of the nineteenth century — the 'age of acclimatization'. Perhaps some expatriate American, newly wealthy from a lucky strike on the goldfields sought to enhance the garden of his suburban mansion with a reminder of home. Barrett (1934) suggested that Sir Frederick Sargood acclimatized squirrels at 'Rippon Lea', perhaps during the 1880s. But it seems strange, in retrospect, to think of an English gentleman importing these brash little animals in preference to his native, gentle Red Squirrel (*Sciurus vulgaris* L.). After all, Eastern Grey Squirrels were first introduced to England only in 1876 — and almost ever since have been considered a pest (Barkalow and Shorten 1973). Nevertheless, Sargood was in England between 1879 and 1882 (Strahan, 1977), and may have obtained the animals at that time.

Whatever their origin in Melbourne, Eastern Grey Squirrels were, by the early years of this century, well established in many south-eastern suburbs (Fig. 1) and remained so until the 1940s. A colony was also established at Ballarat during the late 1930s.

The Melbourne Colonies

There seem to have been four discrete colonies in Melbourne (Fig. 1) and, although this may merely reflect a lack of records, I have considered each suburban group separately.

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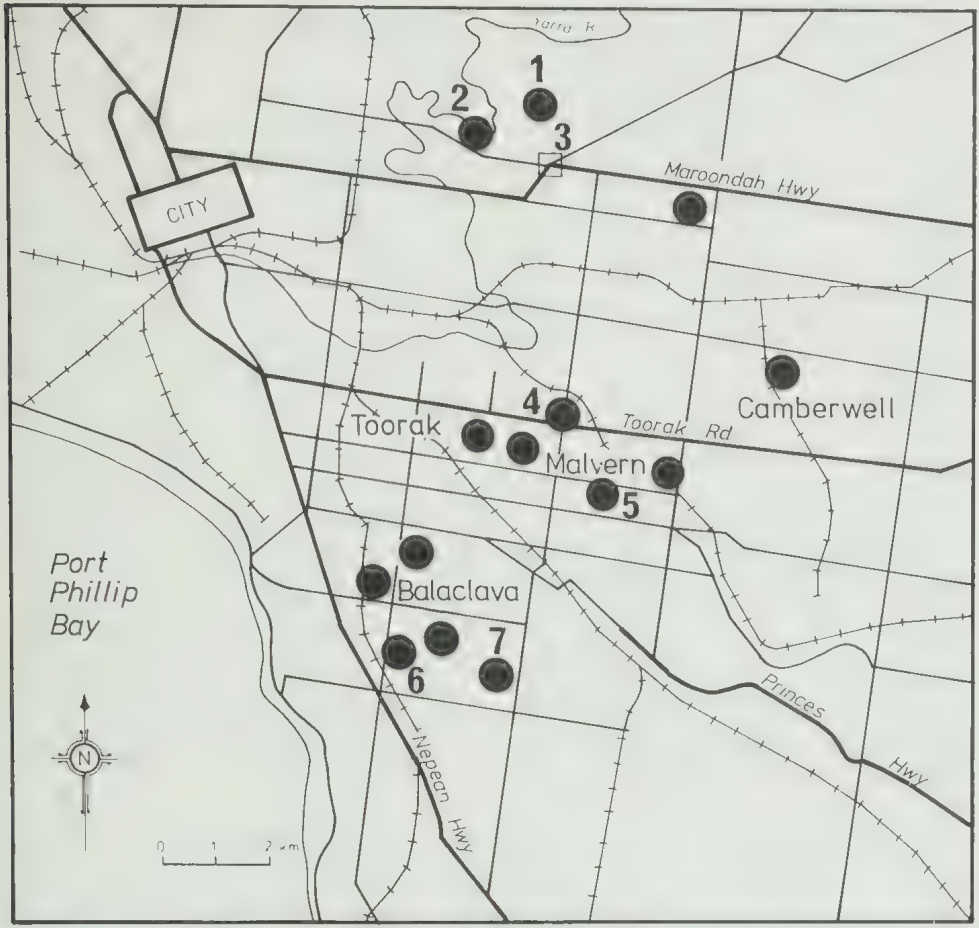
1. Elsternwick-Caulfield. The colony at 'Rippon Lea' seems to have been the origin of animals dispersing to surrounding areas. Benjamin Nathan, who owned the property from 1909 until his death in 1935, maintained the property in a grand manner, as had Sargood, and this included the active encouragement of the squirrels. Mr Frank Scott, who worked as a gardener at 'Rippon Lea' from about 1930 to the late 1970s recounted how the squirrels were fed with cereals (pollard, bran, maize and wheat) to supplement the food they gleaned from the decorative trees (oaks and Moreton Bay figs), the orchard and the vegetable garden. Crushed acorns were a favourite food, and soft-fruit trees in the orchard had to be protected from the squirrels. The squirrels in turn had to be protected from the cats on the property (Scott, *pers. comm.*).

As well as building nests in trees the squirrels made their homes in hollowed-out sections of staghorn ferns in the big fernery. Barrett (1934) reported nesting in eucalypts, treeferns, the roof of the fernery and that of the tennis pavilion. The squirrels did not hibernate but remained active throughout the winter. They bred between October and February (Watts and Aslin, 1981). Mr Scott estimated the population to be at its peak of about 120-130 in the 1930s. During the war years (1939-45) the gardening staff at 'Rippon Lea' was reduced, and care of the squirrels had to give way to other more important tasks. As a result, cats and possums were often seen harassing squirrels, for example, evicting them from nests. After the war squirrels declined dramatically in numbers and were last seen about 1948-50.

A colony lived in the grounds of Caulfield Repatriation Hospital in Kooyong Road until the mid 1920s (Barrett, 1934), and McCance (1967b) quoted a correspondent who remembered them in the Moreton Bay fig trees in the grounds of St Mary's Church of England in Glen Eira Road. Both of these localities are less than 2 km from 'Rippon Lea'. Barrett (1934) also listed Balaclava and East St Kilda as supporting squirrels.



1. KEW PSYCHIATRIC HOSPITAL
2. STUDLEY PARK
3. KEW JUNCTION
4. TOORAK TRAM TERMINUS
5. MALVERN GARDENS
6. 'RIPPON LEA'
7. CAULFIELD HOSPITAL

Fig. 1. Distribution of the Eastern Grey Squirrel in Melbourne, 1880s-1940s.
Colony 1: Elsternwick - Caulfield (Nos. 6, 7)
Colony 2: Toorak-Malvern (Nos. 4, 5)
Colony 3: Kew (Nos. 1, 2, 3)
Colony 4: Camberwell

2. Toorak-Malvern. A large colony lived in the Clendon Road/Irving Road area, north of Malvern Road, where, until the mid-1920s, many properties were very large and had established gardens. Mr H. S. L. Clark recalled squirrels regularly visiting a large almond tree — both to feed upon the fruit and to carry it away for storage (Clark, *pers. comm.*). McCance (1967a) observed squirrels living in oak trees in Irving Road during the first decade of the century. He also described watching squirrels 'dance' along fences near the Toorak tram terminus (McCance, 1971).

Mrs E. A. Male remembered squirrels gathering acorns from oak trees in the Malvern Gardens opposite the Park Street State School about 1920 (Male, *pers. comm.*).

Mrs R. Pescott also recalled squirrels in the Malvern Gardens from 1915-1933. Mr G. Styles was Curator of those gardens from 1939, and did not remember any squirrels being present. They must therefore have disappeared in the mid-1930s, although there were plenty of oak trees in the Gardens (Churchill, *pers. comm.*).

3. Kew. A small colony lived in the oak trees along the drive of the Kew Mental Hospital. Mr. A. E. Howard recounted how, during the years 1933-36, he regularly visited the hospital and fed the timid squirrels (never more than 2 or 3) with three-penny worth of hazel nuts (Howard, *pers. comm.*).

Mrs N. Oates remembered squirrels playing in a huge old oak tree in the grounds of a Victorian mansion in McCartney Avenue, Kew, before World War II (Oates, *pers. comm.*).

McCance (1971) said that a colony lived near Studley Park, Kew.

4. Camberwell. Barrett (1934) stated that squirrels were present at Camberwell but gave no other details.

I received one report of squirrels adjacent to the Royal Botanic Gardens, but former Directors Mr A. Jessep (1941-57) and Mr R. Pescott (1957-1970) were certain that no squirrels were present in the Gardens during their respective terms of office (Churchill, *pers. comm.*).

An undated, unsourced newspaper clipping shows a grey squirrel feeding from a saucer, and the caption reads: "Two of these engaging little animals have been added to Melbourne Zoo's 'free list'. They escaped from an aviary soon after arrival, and are now at home in the elms and other trees at the Gardens". The clipping (which is in my possession) is from a Melbourne paper of the 1930s.

In summary then, the species appeared to do quite well in suburban Melbourne, occupying an area about 10 km by 6 km.

Why they should have disappeared in such a relatively short time (the decade 1940-50) I do not know. The post-war increase in Melbourne's population was only just beginning, and it was before the subdivision of some of the larger properties where the squirrels may have found a good living in well-established gardens. It is difficult to conceive of a dramatic increase in the suburban cat population, and motor cars were still few, a legacy of war-time rationing. It is known that there was competition from Common Brushtail Possums, *Trichosurus vulpecula*, for acorns (R. Dunn, *pers. comm.*). and the same was probably true for other exotic fruits and nuts. Perhaps the drought of 1943/4 reduced acorn production (which varies from year to year anyway). If this were coupled with a lack of artificial feeding due to the stringencies of wartime living, it may have been sufficient to cause an irreversible decline in the Melbourne population.

The Ballarat Colony

Late in 1937 Mr. T. C. Toop, curator of the Ballarat Botanical Gardens, arranged for a pair of squirrels to be obtained from 'Rippon Lea'. Sent to

Ballarat by train, they were released in the gardens on Saturday, 1 November 1937.

Mr Tom Beaumont, who succeeded Mr Toop, told how one of the animals refused to vacate its box and how during the subsequent attempts to persuade it to run free its tail was pulled off; despite this early set-back, the animals survived. The species became established in the Gardens and later spread up to about 1 km away. These first pair of squirrels were hand-fed with whole maize, soaked to soften it. They became quite unafraid, often feeding while the staff were still present (Beaumont, 1978). The colony in the Gardens eventually numbered more than 100 (Wheeler, 1968). As the colony grew, hand feeding was discontinued, but the squirrels adapted to food from the trees and shrubs in the Gardens — acorns from the several varieties of oak trees, Hawthorn berries, the fruits of the Irish Strawberry (*Arbutus*), walnuts, elm 'hops', maple seeds, chestnuts and of course the handouts and 'leftovers' of visitors. Gardeners tending flower beds often turned up caches of nuts. Barrett (1934) and Wheeler (1968) related how the squirrel skilfully removed the embryo of the nuts to prevent germination of the seed.

Wheeler (1968, 1969) described the squirrels' play and nest-building behaviour. These agile little animals could leap 5-8 m from trees to the lawns. He described their nests as "untidy structures" of leaves and bark, frequently built in most exposed situations where they were often damaged by wind. Mrs B. Strange reported that nests were not built in tree hollows even when these were available and commented also upon the untidy nests, made from branch tips 150-200 mm in length, which had been bitten from trees and shrubs. Large quantities of branch tips were utilized — "a barrow-load of tips in a week". (Strange, *pers. comm.*). Breeding in the colony was never monitored, but Wheeler (1969) suggested that 3-4 young were born during mid-summer. One hand-reared pet squirrel lived for at least 13 years.

A few squirrels were captured and kept in captivity in the Ballarat Zoo (within the Botanical Gardens) which operated from 1917 to 1960. The squirrels spread throughout the gardens around Lake Wendouree and into adjacent private gardens. Fig. 2 shows the distribution in Ballarat — they were very restricted indeed.

Streets such as Webster Street with old, established gardens provided a

Table 1. Specimens of Eastern Grey Squirrel killed by motor vehicles in Ballarat. All are preserved as study skins and skull remains, and are lodged in the Museum of Victoria.

FWD No.	Museum No.	Sex	Locality	Date
R 3027	C 16411	F	Wendouree Pde	11 March 1965
R 3028	C 16410	F	Wendouree	7 April 1965
R 3029	C 16412	F	Wendouree Pde	29 April 1965
R 3082	C 22613	M	Gillies Street	11 June 1966

Table 2. Measurements of two road-killed Eastern Grey Squirrels.

	Lengths (mm)					Weight (gm)
FWD No.	Total	Tail	Head	Ear	Pes	
R 3029	465	210	—	30	55	458
R 3082	443	175	62	29	45	618

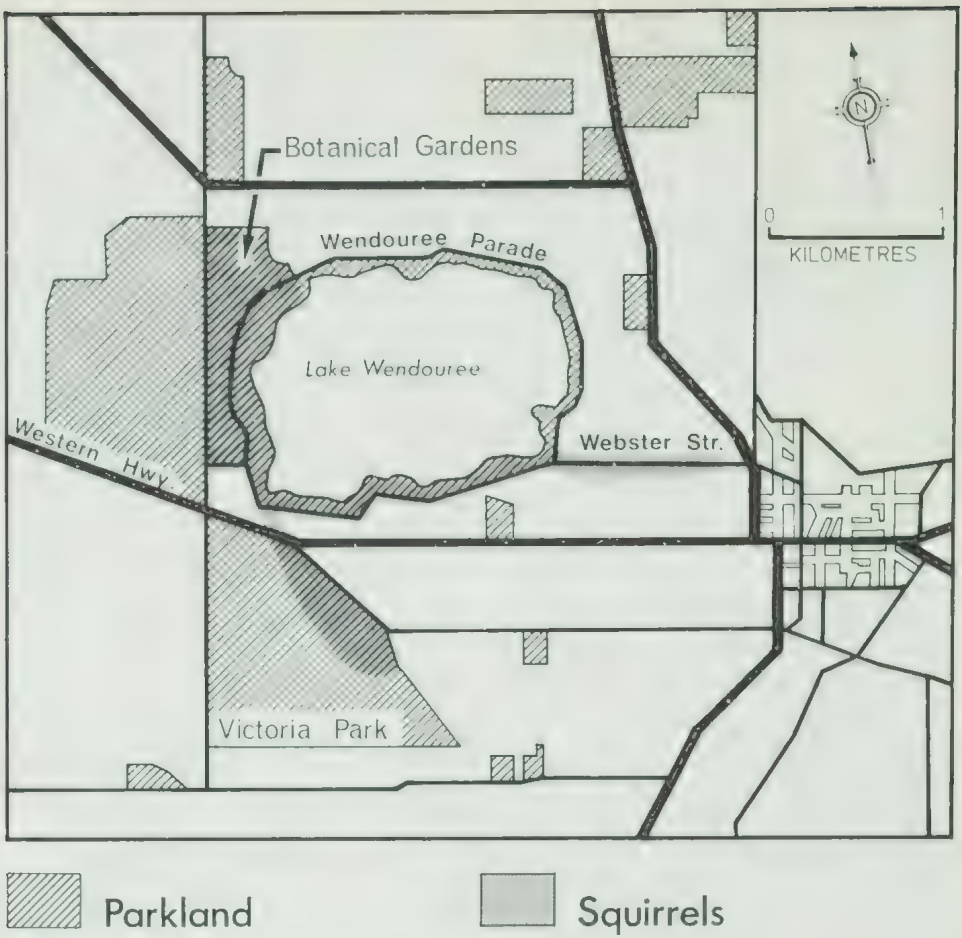


Fig. 2. Distribution of the Eastern Grey Squirrel in Ballarat, 1937-1973.

haven for squirrels, and several people (notably Mrs G. Taylor) have furnished me with their recollections of squirrels playing in and/or feeding upon oak, redwood, pine, monkey puzzle and walnut trees.

From the very beginning, cats preyed upon the squirrels; Mr Beaumont recalled having regularly found partly eaten squirrels; other predators included ravens and small boys. Later, the motor car was a frequent killer and several road-killed squirrels donated to the Fisheries and Wildlife Division (FWD) in 1965-6 are the only specimens of Victorian *Sciurus* in existence (Table 1). Of these only two were measured (Table 2).

During the early 1960s R. M. Warneke (FWD) sought, for taxonomic determination, specimens of squirrels from Ballarat. Mr and Mrs A. Strange and Mr and Mrs E. Bedggood, members of the Ballarat Field Naturalists' Club, attempted, without success, to live-trap squirrels during 1963-5. They also reported observations on squirrel distribution and activity, and were responsible for the donation of the road-killed specimens referred to above.

The squirrel population in Ballarat began to decline from the late 1950s, and cats were considered to be the main cause (Wheeler, 1964). The squirrels might also have had to compete with Common Brushtail Possums (*Trichosurus vulpecula*) for food and nest sites. R. Dunn (*pers. comm.*) observed that in 1968 the possums were taking large quantities of unripe acorns and thus depriving the squirrels of their staple food.

In 1968 some squirrels were trapped and used in a TV commercial for chocolate (Hamilton, 1968). Some were kept in captivity after this event, both privately and at the Royal Melbourne Zoo where four were held for about a year, but did not breed (R. Dunn, *pers. comm.*).

Wheeler considered that the population was facing extinction in 1969 when very few had been seen (Wheeler, 1969). The last recorded, confirmed observation was in early 1973 (Wheeler, 1973), when one squirrel was seen just north of Lake Wendouree.

In 1974, when I wished to photograph the animals, none could be located (J. Clements, Fisheries and Wildlife Officer, *pers. comm.*). Subsequent reports of sightings in Victoria Park, south of Lake Wendouree could not be confirmed.

In 1975 J. C. Taylor (who had worked on grey squirrels in England) visited Ballarat. He was not able to locate any signs of squirrels, and stated in a letter to John Clements (FWD Ballarat) "only a few of the locations looked as if the

Fig. 3. Eastern Grey Squirrel, *Sciurus carolinensis* Gmelin. Captive, hand-reared specimen, Ballarat, ca. 1960.
Photograph: Trevor Pescott.

trees were old enough to act as reliable home and food sources. The oak trees should be about twice the size . . . with some rotting limbs and holes in the trunks". He further commented on the abundance and growth of acorns beneath the trees, which "never happens in Europe or North America" (Taylor, *pers. comm.*).

It thus appears that the squirrels have become extinct in Ballarat as they did in Melbourne.

Of all the animals introduced to Australia in the nineteenth century they were probably the most attractive — and certainly one of the most inoffensive.

Acknowledgements

This record would not have been possible were it not for the interest and cooperation of a large number of people. Especially I am indebted to Bob Warneke, Fisheries and Wildlife Division, who first became curious about the Ballarat squirrels, and who has generously permitted me access to his records and correspondence. The late Stella Bedggood and her husband Ted, and Bert and Bon Strange from Ballarat were early sources of information. John Clements (FWD Ballarat), Jack Wheeler, the late Norman McCance and Frank Scott (late of Rippon Lea) all helped with information which was also generously given by: Dr D. Churchill, Messrs S. Baker, H. Clark, W. Greville, A. Howard, A. Jessep, K. Langton, R. Milne, W. Moore, J. Nicholls, R. Pescott, T. Pescott, G. Pizzey, I. Smith, J. Taylor, R. Walkley, Mesdames S. Elliott, E. Lamb (daughter of Mr T. Toop), E. Male, M. Morrison, N. Oates, S. Patterson, G. Taylor and Miss I. Fenton. Mr T. Beaumont deserves a special mention, as much of the early history of a Ballarat colony has been derived from his recollections.

Trevor Pescott permitted his photograph to be used. Alicia McShane (FWD) drew the maps. Darwin Evans, Peter Menkhorst and Bob Warneke helped improve the manuscript, which was typed by Lyn Sharpe.

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Natural Resources Conservation League	$25.00
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Native Mammals of the Mt. Timbertop Region, North-eastern Victoria

By David Nicholls* and Charles Meredith†

Introduction

This paper presents data on the local distributions of native mammals collected by the staff and students of Timbertop School (Geelong Church of England Grammar School), 10 km WSW of Mt. Buller, between 1971 and 1976.

The bulk of the data were collected from the school area but a number of short surveys and many opportunistic observations considerably extended the area covered.

Area Description

The survey area lies on the boundary between the Victorian alps and the Mansfield plains. The topography is highly varied, ranging from cliffed escarpments and alpine peaks at heights of 1700-1800 m through sub-alpine and foothill forest down to undulating pasture land at 440 m. The climate is characterised by dry, hot summers and wet, cold winters, with snowfalls at the higher elevations.

We delimited nine broad habitat types utilised by mammals in the region:

1. Pasture (P) — cleared and semi-cleared land.
2. Aquatic (Aq) — rivers, streams and dams.
3. Swamps (Sw) — sedgelands or grasslands on soils of high moisture status.
4. Broad-leaved Peppermint *Eucalyptus dives* open forests (B) — typically on dry foothill ridges.
5. Narrow-leaved Peppermint *Eucalyptus radiata* open forests (N) — typically in gullies and on the wetter foothill ridges.
6. Riparian (R) — usually an open forest of Manna Gum *Eucalyptus viminalis* (sometimes Swamp Gum *Eucalyptus ovata)* and/or Narrow-leaved Peppermint, associated with the valleys of the major streams.
7. Alpine Ash *Eucalyptus delegatensis* open forests (A) — sub-alpine ridges and slopes between 1000-1300 m.
8. Snow Gum *Eucalyptus pauciflora* open forests and woodlands (SG) — a sub-alpine habitat occurring above 1200 m.
9. Alpine Heath (H) — low ($<$ 1 m), treeless shrubland occurring at heights above 1450 m.

Further data on the region's physiography, climate and vegetation can be found in the Land Conservation Council (1977) report on the Alpine Area.

The school area abutted habitat type P and contained areas of habitats Aq, Sw, B, N and R.

Methods

Most data were collected in the course of research projects undertaken by students as part of their biology curriculum. These projects included ground and arboreal mammal trapping, spotlighting surveys and tracking of tagged phalangerids, radiotelemetry, macropod counts, and studies of platypuses and wombats. All sightings or trap records were recorded in a card file and any dead specimens found were placed in the school's museum collection. Students and staff were encourag-

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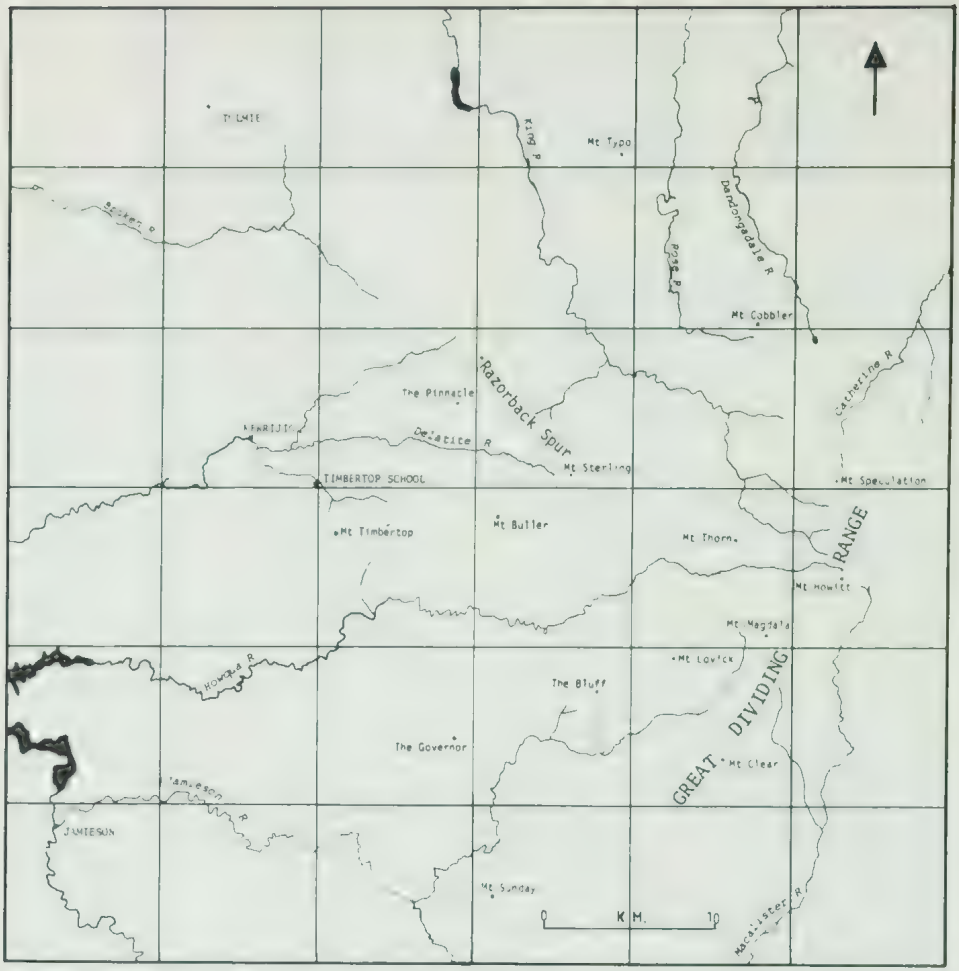

Fig. 1. Map of study area

ed to add any incidental observations they made, generally while hiking in the area, to the card file. Sight records were accepted for larger animals (eg. those over 1 kg), but only hand-held or specimen records were accepted for smaller species. Carnivore scats were collected from a number of localities and hair samples from these were identified by Brian Coman and Hans Brunner of the Keith Turnbull Research Institute.

Results

Seven hundred and fifty-five individual records were collected, 495 (66 per cent) from the school area. Two species of monotremes, 15 marsupials, three rodents and four species of bats were recorded. The species are discussed individually below. For each species brief comments are made on abundance and habitat preference, the habitats from which it was recorded are listed, and the total number of records is given, with the number of records from the actual school area (TT) in brackets. The distribution of each species is indicated by a map showing all recorded localities.

Tachyglossus aculeatus (Short-beaked Echidna) — may be more common than the records suggest; prefers drier areas with friable soils. P, B, SG; 7 records (3 TT).

Ornithorhynchus anatinus (Platypus) — common in all rivers and larger streams, usually inhabiting deep (1-2 m) pools with steep earth banks, but recorded several times from small creeks about 1 m wide and 0.15-0.2 m deep. One young male was recorded walking across a logging road in the upper Howqua Valley. Aq; 19 records (2 TT).

Antechinus stuartii (Brown Antechinus) — very common. Sw, B, N, R, A, SG; 59 records (34 TT).

Antechinus swainsonii (Dusky Antechinus) — common. Only recorded from habitats with a dense vegetation cover — this may be associated with its partly diurnal activity pattern (Hall, 1980). Often sympatric with *A. stuartii,* except in alpine heath, where only *A. swainsonii* was recorded. Sw, N, R, A, SG, H; 22 records (10 TT).

Phascogale tapoatafa (Tuan) — not recorded locally, but there is one specimen in the collection from Yackandandah ("caught by cat, 2/4/73 at an isolated farm house").

Parameles nasuta (Long-nosed Bandicoot) — uncommon, seldom seen or trapped. Conical diggings, probably of this species, regularly noted in riparian areas. P, N, Sw, R; 10 records (7 TT).

Trichosurus caninus (Bobuck) — restricted to sub-alpine forests. A, SG; 3 records (0 TT).

Trichosurus vulpecula (Common Brushtail Possum) — common; not in sub-alpine forests. P, B, N, R; 61 records (55 TT).

Acrobates pygmaeus (Feathertail Glider) — few sightings, probably underestimated. B, N; 4 records (1 TT).

Cercartetus nanus (Eastern Pygmy Possum) — a record from Tolmie, "found in post-hole". Three were recovered from a felled dead tree at Sheepyard Flat. N, R; 4 records (0 TT).

Petaurus breviceps (Sugar Glider) — rare. Two tails referable to this species (presumably from cat kills) were found, and there are two sightings. B; 4 records (4 TT).

Pseudocheirus peregrinus (Common Ringtail Possum) — moderately common. B, N, R; 25 records (22 TT).

Petauroides volans (Greater Glider) — common in habitats N and R, less so in B. Pairs sedentary with well defined home ranges (as determined from observations of tagged individuals). Densities can be quite high — we recorded 42 sightings in 4 kilometres of spotlighting in riparian and narrow-leaved peppermint forests along Eight Mile Creek, and five individuals were known to inhabit two adjacent trees near the school. Only dark-phase individuals recorded in the study area, but in the Strathbogie Ranges (50 km west) light-phase individuals are common (DGN, pers. obs). B, N, R; 98 records (44 TT).

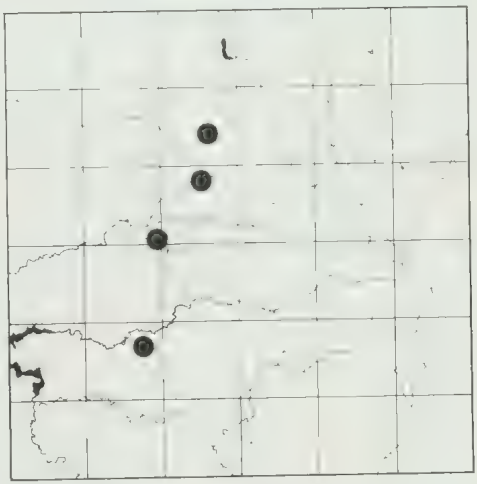

Fig. 2. *Tachyglossus aculeatus*

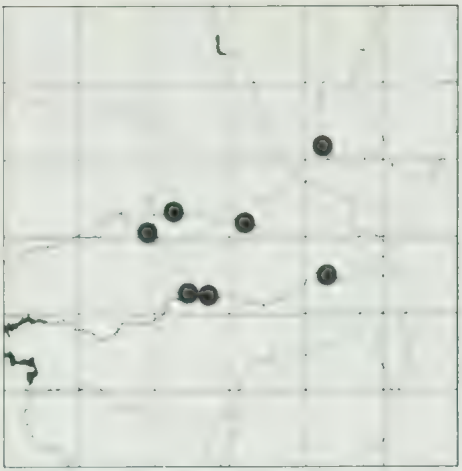

Fig. 3. *Ornithorhynchus anatinus*

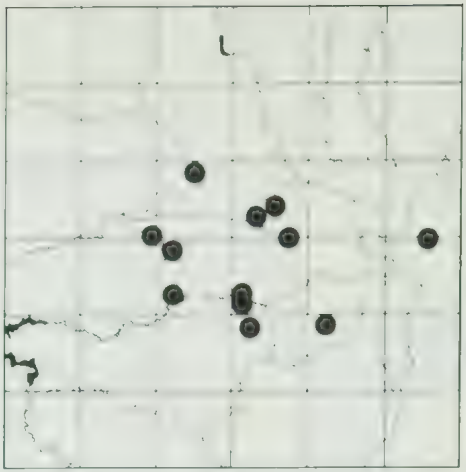

Fig. 4. *Antechinus stuartii*

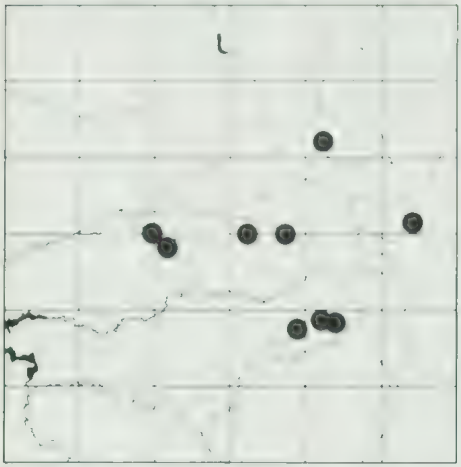

Fig. 5. *Antechinus swainsonii*

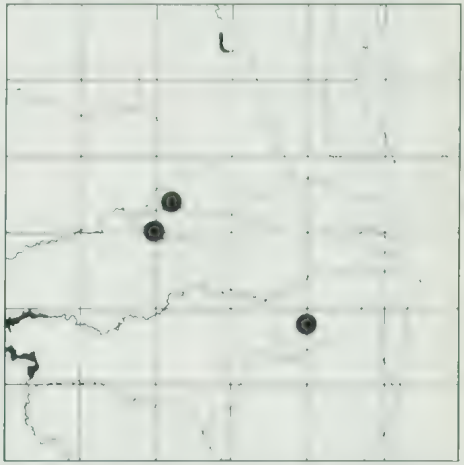

Fig. 6. *Parameles nasuta*

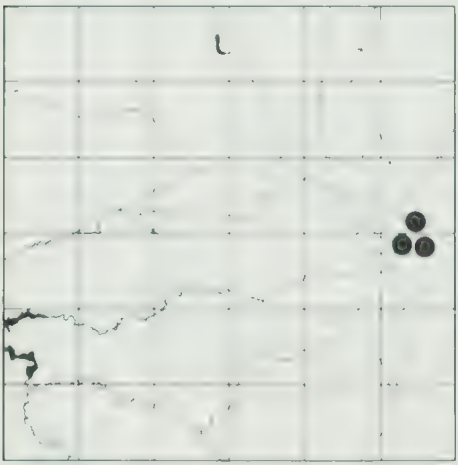

Fig. 7. *Trichosurus caninus*

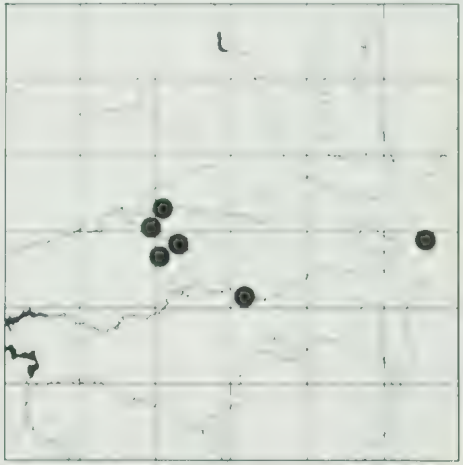

Fig. 8. *Trichosurus vulpecula*

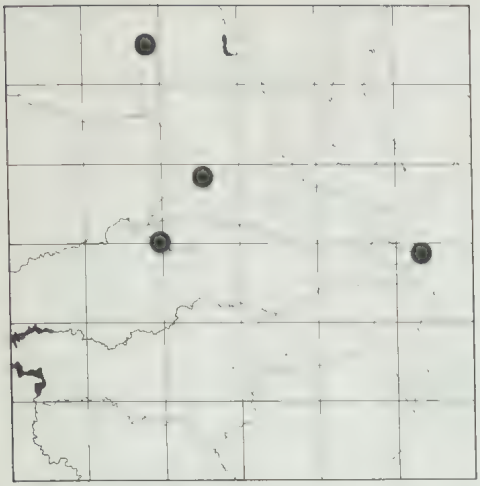

Fig. 9. *Acrobates pygmaeus*

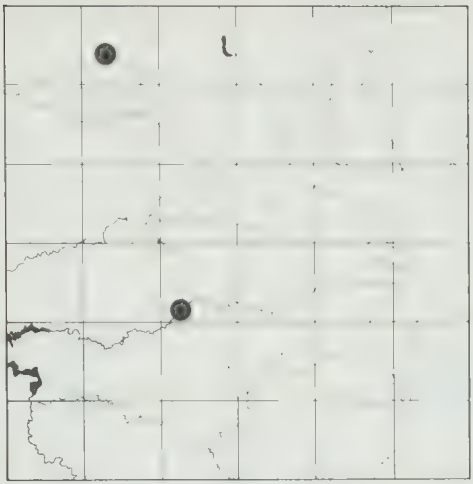

Fig. 10. *Cercartetus nanus*

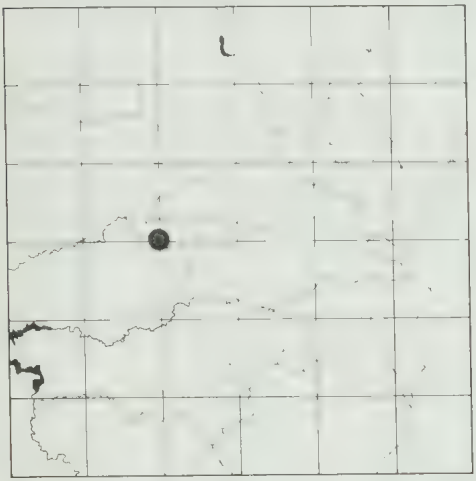

Fig. 11. *Petaurus breviceps*

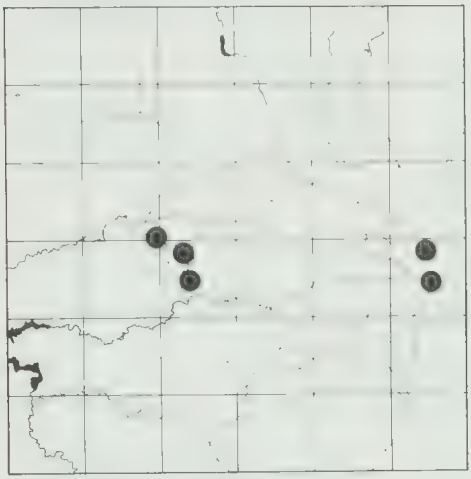

Fig. 12. *Pseudocheirus peregrinus*

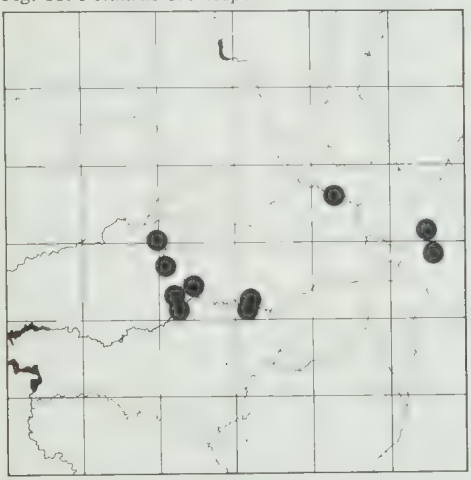

Fig. 13. *Petauroides volans*

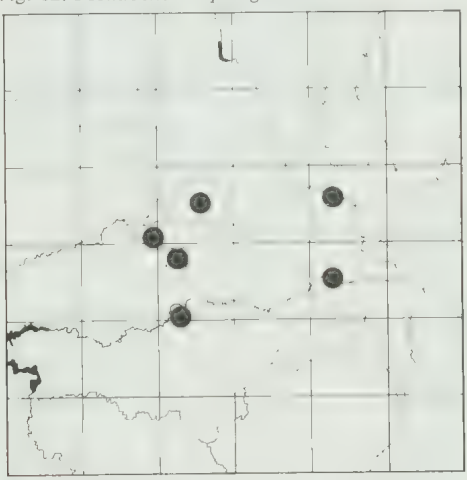

Fig. 14. *Macropus giganteus*

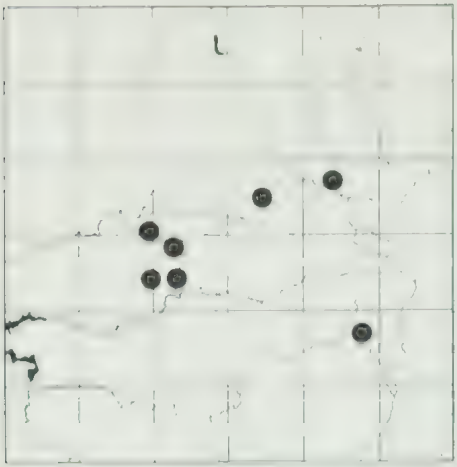

Fig. 15. *Wallabia bicolor*

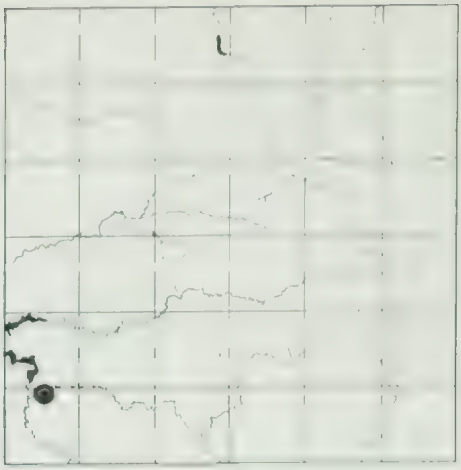

Fig. 16. *Phascolarctos cinereus*

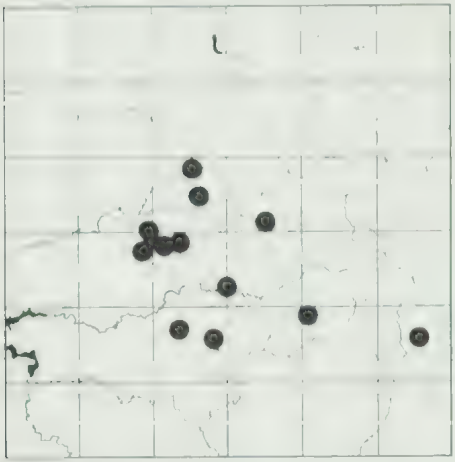

Fig. 17. *Vombatus ursinus*

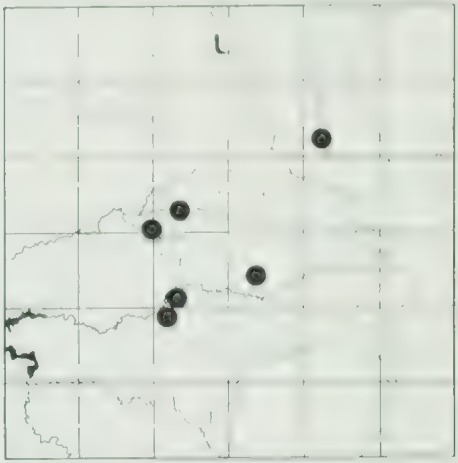

Fig. 18. *Hydromys chrysogaster*

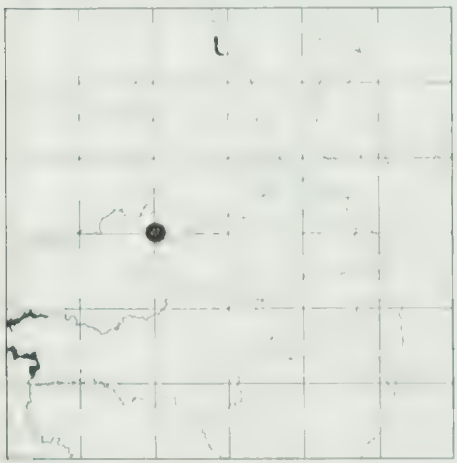

Fig. 19. *Mastacomys fuscus*

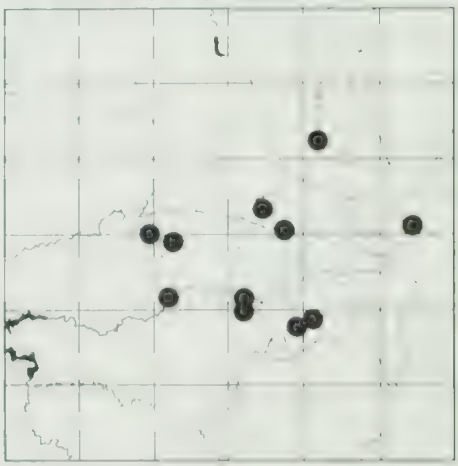

Fig. 20. *Rattus fuscipes*

Macropus giganteus (Eastern Grey Kangaroo) — common where forest abuts pasture, moderately common in dry forests, occasional in wetter forests. P, B, N, R; 62 records (57 TT).

Wallabia bicolor (Swamp Wallaby) — occurs in wet forest below 1000 m and in areas of dry forest with a dense understorey. B, N, R; 12 records (6 TT).

Phascolarctos cinereus (Koala) — one record from "near Jamieson, April 1971". Locals recall them being in the Tolmie region in the 1940s.

Vombatus ursinus (Common Wombat) — moderately common in most habitats. P, B, N, R, A, SG, H; 25 records (11 TT).

Chalinolobus morio (Chocolate Wattled Bat) — occasionally captured in school buildings. 4 records (4 TT).

Eptesicus spp. — occasionally captured in school buildings; a small colony roosted in the roof of one building. 5 records (5 TT).

Nyctophilus geoffroyi (Lesser Long-eared Bat) — occasionally captured in school buildings; a colony of *c.* 12 was found in a nearby tree hollow. 9 records (9 TT).

Nyctophilus timoriensis (Greater Long-eared Bat) — one record from TT.

Hydromys chrysogaster (Water-rat) — moderately common in rivers; also in some small streams. Aq; 12 records (7 TT).

Mastacomys fuscus (Broad-toothed Rat) — one specimen caught in a swampy sedgeland near the school (1/3/73). Identification confirmed by R. Warneke, Fisheries and Wildlife Division. Intensive further trapping over several months was unsuccessful. Sw; (1 TT).

Rattus fuscipes (Bush Rat) — very common. Sw, B, N, R, A, SG, H; 250 records (212 TT).

Discussion

The region supports 24 species of native mammals, 70 per cent of the total recorded for the whole Victorian alpine region (Land Conservation Council, 1977). The species present represent the typical fauna of the mountain regions of south-eastern Australia, and there are no records of any rare or endangered species, except for the uncommon relict species *Mastacomys fuscus*.

Despite a long history of human disturbance — gold-mining, selective timber-getting, grazing, burning, partial clearance, construction of buildings, roads, etc. — the school area still supports 19 species of native mammals, generally at high population densities. The near complete absence of rare or specialist species is, however, notable, as the high sampling intensity makes it unlikely that any resident species has been missed.

Acknowledgements

We wish to thank all those who contributed records, particularly the staff and students of the school. John Woinarski, Neville Walsh and Jenifer Nicholls all made major contributions to the data. The project was initiated with the support of Prof. G. B. Sharman and the CSIRO Science and Industry Endowment Fund. The Land Conservation Council (Victoria) provided additional funding.

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Dune Calcarenite and Shore Platforms at Cape Otway, Victoria

By E. C. F. Bird*

Introduction

The coastline of the Otway Ranges consists generally of cliffs and bluffs, with bordering shore platforms and rocky foreshores, cut into the Lower Cretaceous sandstones and shales of the Otway Group. However, on the south-facing coast between Cape Otway and Point Franklin (Fig. 1) the Lower Cretaceous rocks are partly mantled by Pleistocene dune calcarenites, which form steep bluffs behind sectors of flat shore platform cut into these Pleistocene formations (Fig. 2). The dune calcarenites are here of particular interest because, instead of being derived from the adjacent sea floor, as is usually the case, they developed from wind-blown sands that moved across the broad promontory of Cape Otway from W.N.W. to E.S.E. to accumulate on the lee shore, where they conceal the features of a much older rocky coastline. This article describes the coastal landforms at Cape Otway, deduces their mode of evolution, and indicates points of geomorphological interest.

Coastal Landforms (Fig. 3)

At Cape Otway there are cliffs up to 80 metres high cut in Lower Cretaceous sandstones beneath the lighthouse, and the rocky foreshore consists of structural benches and ramps, with sectors of flat shore platform. In detail, the influence of geological structure is evident, with minor scarps and dip-slopes flanking a dissected anticlinal fold, and intersecting clefts and gullies excavated by marine erosion along joint planes.

To the east, these cliffs are capped by Pleistocene dune calcarenites, overlain by unconsolidated, presumably Holocene, calcareous sand dunes. Groundwater rich in dissolved carbonates has percolated down through joints, and down the cliff face, to produce tufa and dripstone formations, well seen in a small cave just east of the lighthouse (Fig. 4). Towards Otway Cove the dune calcarenite mantle extends down to high tide level, the cliffs in Lower Cretaceous rock disappearing behind steep scrubby slopes, with boulders of grey sandstone and paler calcarenite behind a broad shore platform cut in Lower Cretaceous sandstone.

At Otway Cove a wide beach of firm, fine sand interrupts the shore platform, and when it resumes on the eastern side it is cut in Pleistocene dune calcarenite, which here overlies and conceals an earlier platform cut in Lower Cretaceous sandstone. Beside the beach the basal calcarenite is conglomeratic, with included well-rounded pebbles of grey Lower Cretaceous sandstone, derived from earlier beach gravels.

Between Otway Cove and Shelly Beach the cliffs are of Pleistocene dune calcarenite, showing laminae inclined steeply to the S.S.E., indicating that the dunes were built in this direction from sand that had moved across the Cape Otway promontory. The cliff base is fringed by large boulders of dune calcarenite, showing typical karstic weathering features such as intricately pitted surfaces, at the back of a flat platform up to 70 metres wide, cut into dune calcarenite, and carpeted with grapeweed *(Hormosira* sp.*)* and mixtures of green and brown algae, with kelp adhering to the seaward edge. A prominent stack, with basal notching, rises from the shore platform here (Fig.

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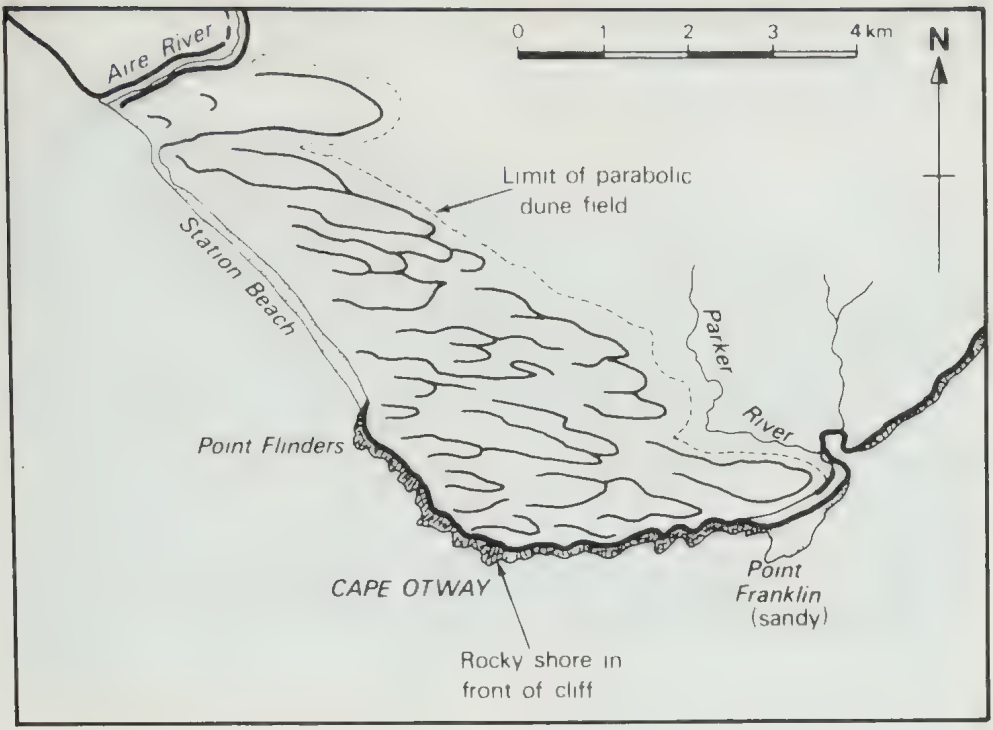

Fig. 1. Cape Otway, showing extent of parabolic dune field.

2). The features are similar to those of cliffs and shore platforms on other Pleistocene dune calcarenite coasts in Victoria, such as the ocean coast of the Nepean Peninsula (Bird, 1975).

Shelly Beach is dominated by coarse calcareous sand, with scattered pebbles of calcarenite and broken shells. The underlying Lower Cretaceous sandstone reappears on the foreshore, and outcrops in ribs of rock to the east, where there are conspicuous scour potholes (cf. Bird, 1970). The base of the Pleistocene dune calcarenite is locally exposed here, and includes a horizon of elongated ropey calcretes, with intervening cavities, arranged at right-angles to the coastline. These are probably due to groundwater seepage, which washes out conduits in phases of stronger flow, and provides a source of carbonate for re-precipitation alongside these when the outflow is more gradual. Hereabouts the dune calcarenites occur patchily on the foreshore between slightly higher areas of Lower Cretaceous sandstone, but to the east the dune calcarenite platform is again more continuous in front of bouldery talus at the cliff base. Locally, segments of a higher bench cut in Lower Cretaceous sandstone interrupt the backshore, and pass landward beneath the apron of dune calcarenite, which clearly spilled across a pre-existing cliff-and-rocky shore topography cut in the older sandstones.

Kelp Cove has a beach of coarse, white quartzose sand alongside Red Point, a headland of dune calcarenite eroded into ledges that correspond with outcrops of reddish palaeosols and associated white calcrete. Similar to the ancient soils that outcrop on the Nepean ocean coast (Bird, 1972), these indicate pauses in dune sand accretion sufficient for surface weathering and soil formation. They are overlain by younger, unconsolidated dune sands which form the

Fig. 2. Shore platform and stack in Pleistocene dune calcarenite, looking westwards to Cape Otway, where the cliffs and shore platform are cut in Cretaceous sandstones. Photo: E. C. F. Bird

surface topography of much of the Cape Otway peninsula (Fig. 1).

East of Red Point the Pleistocene dune calcarenite rests upon layered black peat and grey clay deposits, formed in a swampy environment, and underlain by Lower Cretaceous sandstone. The age of these deposits is not known, but it is possible that they originated in Pleistocene times, immediately before their burial by drifting sand.

Between Red Point and Crayfish Bay the foreshore consists of a boulder-strewn platform cut mainly in Lower Cretaceous sandstone, but with some patches of planed-off dune calcarenite (Fig. 5). These are thin slabs of calcareous rock, immediately underlain by a much older platform cut in Lower Cretaceous sandstone. The most extensive of them runs out on to Long Point, west of Crayfish Bay, where its seaward limit shows that the Pleistocene dune calcarenite formerly extended at least half a kilometre seaward of the buried cliffed coastline cut in Lower Cretaceous rocks.

Discussion

The relationships between Lower Cretaceous and Pleistocene rock formations on the coast between Cape Otway and Point Franklin indicate that the dune calcarenites were emplaced when sand drifted across the Cape Otway promontory to spill over a pre-existing cliff and shore platform cut into the Lower Cretaceous sandstones. The spilling dunes thus buried a coast that had been shaped in a Late Pleistocene phase when the sea stood close to its present level (Fig. 6, A, B). There was a lowering of sea level by the time the dunes were emplaced, or they would simply have been washed away. It is probable that they were deposited during the Last Glacial phase of low sea level, which began about 80,000 years ago. Moreover, since the buried cliff and shore platform show little evidence of

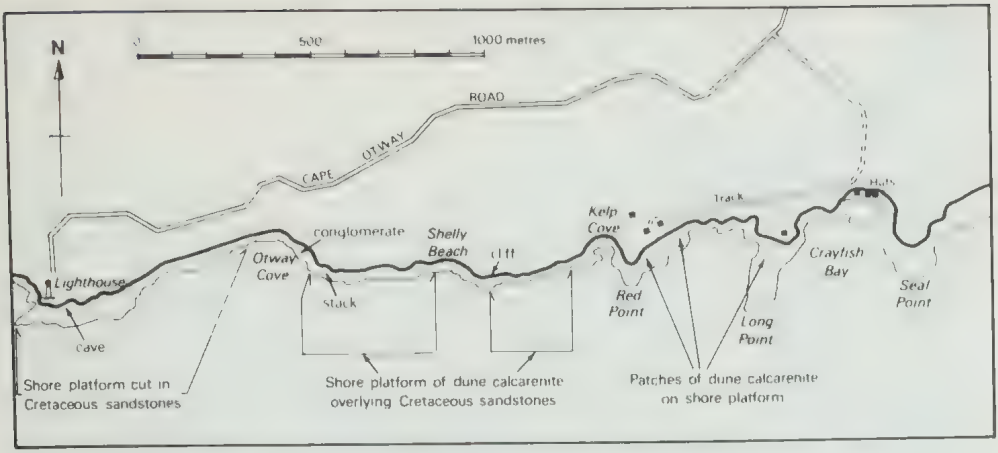

Fig. 3. Coastline between Cape Otway and Crayfish Bay.

subaerial weathering, the dunes must have arrived soon after the sea withdrew.

There was time for these calcareous dunes to become consolidated and lithified into dune calcarenite before the return of the sea, some 6,000 years ago, as a sequel to the world-wide Holocene marine transgression. They were then cut back to form cliffs and shore platforms, as shown in Fig. 6, C. In some sectors the Late Pleistocene cliffs and shore platforms, cut in Lower Cretaceous sandstones, have been exhumed, and modified by further marine erosion. The evidence here, as at Two Mile Bay near Port Campbell (Baker and Gill, 1957), suggests that rocky cliffs on the Victorian coast have been cut back only a short distance during Holocene times, for they stand no great distance landward of Late Pleistocene coastal cliff alignments.

The deduced sequence has been complicated by the fact that younger, presumably Holocene, calcareous dunes have been added to the sand deposits that extend across Cape Otway. As Fig. 1 indicates, these are parabolic dunes with well-defined margins, particularly along the northern boundary, which is clearly seen when driving down the Cape Otway road. These unconsolidated dunes rest upon the Pleistocene dune calcarenites, and have locally spilled over the lee shore to supply beaches, notably at Point Franklin. They are generally stable, held in place by scrub,

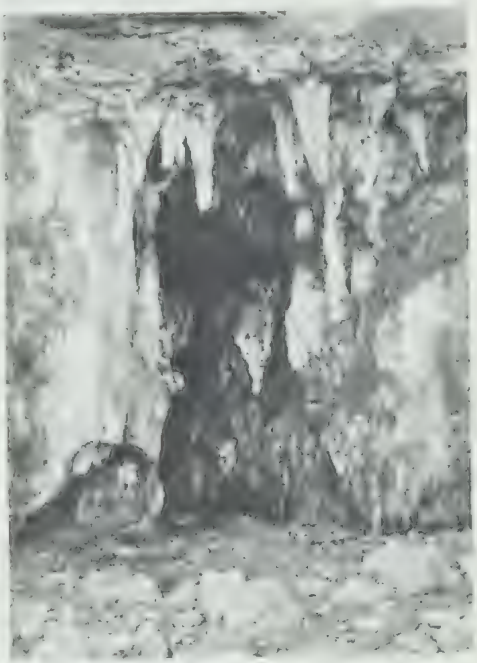

Fig. 4. Cave at the base of the cliff beneath the Cape Otway lighthouse, cut in Cretaceous sandstones but showing dripstone formations derived from percolating groundwater rich in calcium carbonate leached from overlying dune calcarenites. Photo: E. C. F. Bird

Fig. 5. Patches of shore platform cut in Pleistocene dune calcarenite scattered on a foreshore dominated by Cretaceous sandstones east of Cape Otway, looking towards Kelp Cove. Photo: E. C. F. Bird

woodland and grassy pastures, but locally, along their western borders, they include areas of active, drifting sand behind Station Beach and east of the Aire River estuary (Fig. 1). It is evident that successive waves of wind-blown sand have moved across the Cape Otway promontory in Late Pleistocene and Holocene times, in response the prevailing westerly winds.

Such sand drifting across promontories and headlands has been characteristic of the Victorian coastline, and in some cases it is still active. Rosengren (1981) has described and illustrated dunes spilling across Cape Howe, and feeding sand to the eastern (New South Wales) coastline. The Portland peninsula, Cape Schanck, Cape Woolamai, and Cape Patterson are other examples of headlands across which wind-blown sand has drifted eastwards, although generally the dunes have been arrested and stabilised by vegetation. Farther away, the south-facing coastline of Western Australia

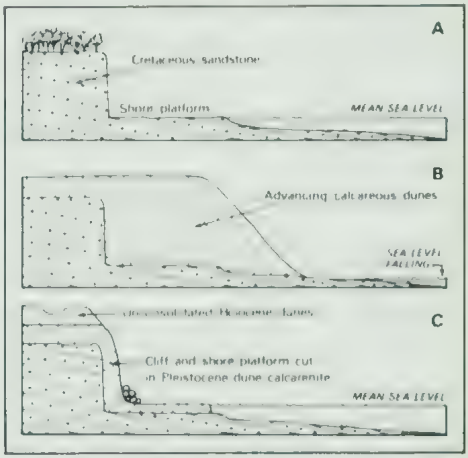

Fig. 6. Evolution of coast between Otway Cove and Shelly Beach (see Fig. 3): A, in Late Pleistocene times, with the sea close to its present level; B, during the ensuing Last Glacial phase of lower sea level, when calcareous dunes spilled across Cape Otway, burying the Late Pleistocene cliff and shore platform; C, as a sequel to the Holocene marine transgression, which brought the sea up to its present level, so that cliffs and shore platforms have been cut in the Pleistocene dune calcarenite. At Cape Otway the dune calcarenite veneer has been removed, and the cliffs and shore platforms are again cut in Cretaceous sandstones.

shows examples of dune migration from west to east across headlands, and in South Africa the eastward migration of sand in this manner has been on an even larger scale: the features of Cape Recife, near Port Elizabeth, where calcareous dunes have moved across a promontory, and shore platforms of dune calcarenite on the eastern flank result from the overspilling of dunes in Late Pleistocene times, are essentially similar to those of Cape Otway (Heydorn and Tinley, 1980).

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Predator Scat Analysis — Availability of Packing Yarn and a Report on an Unusual Dog Scat from East Gippsland

BY ROB WALLIS* AND HANS BRUNNER†

A commonly used technique in mammalian hair analysis involves making a cross-section of a tuft of guard hairs and comparing their shape, sizes and colours with those prepared from pelts of known species or by using photographic keys described in Brunner and Coman, 1974 *(The Identification of Mammalian Hair,* Inkata Press). These authors recommend a packing material be used to surround the hair tuft as it is pulled through the drilled hole in the stainless steel plate so as to prevent the hairs distorting their shape. The 330 decitex cellulose acetate yarn has proved difficult to obtain and we have used several altenatives in order to obtain a satisfactory material. We now have available a 300 denier dull rayon yarn in very limited quantities; the rayon seems to permit an adequate amount of light through the section without dazzling the user (the problem with so many alternative yarns). If other workers in this field are having difficulty in obtaining suitable packing material, we would be prepared to wind some on to a card and post it to them for say a sum of $3 to cover costs.

A review of the uses of predator scat analysis in mammalian research is to be published soon. An interesting dog scat, however, was collected in May last year from the Goonmirk Rocks Reserve area, East Gippsland (8623-671728). It was found to contain the remains of six different species of vertebrate: an unknown bird, Echidna (*Tachyglossus aculeatus*), Tiger Quoll (*Dasyurus maculatus*), Brown Antechinus (*Antechinus stuartii*), Swamp Wallaby (*Wallabia bicolor*) and Mountain Brushtail Possum (*Trichosurus caninus*). We believe this may constitute a record but would be interested to hear of any other unusual finds!

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†Department of Conservation, Forests and Lands, Keith Turnbull Research Institute, Frankston, Vic. 3199

Alf Baker passed away on 28th January, in his 80th year. A member of the Club since 1938 (and past-president) Alf was largely responsible for the setting-up of the Geology Group and was particularly active in that field.

An obituary will appear in a future issue of the Naturalist.

Native Plants at Studley Park and Yarra Bend Reserves

By J. H. Willis*

Melbourne naturalists will always be grateful to Sue McIntyre and Jeff Yugovic for their report on the indigenous flora of the Studley Park area, with a checklist of those 118 species located there during the period 1978-1981 *(Victorian Nat. 99:* 147-52). To see how the vegetation had fared during the severe summer drought of 1982-83, and what revival (if any) had occurred following the good rains of winter and spring 1983, I walked for several hours on 25 October last between the Johnston Street and Fairfield bridges over the Yarra River. About 80 species of native plants were noted, including several additions to the list of McIntyre and Yugovic.

It was pleasing to find that the very localized colonies of Feather Spear-grass *(Stipa elegantissima)* and Peach Heath *(Lissanthe strigosa)* were still holding their own, as was the single known shrub of *Pomaderris racemosa* in the N.E. extremity of the Yarra Bend Reserve (near the bridge into Fairfield). Not only natives were in good shape; the propitious season had also favoured a vigorous growth of weeds. The obvious increase in some bad weeds was alarming, notably Serrated Tussock *(Nassella trichotoma)* in the north-eastern sector. Many little boneseed plants *(Chrysanthemoides monilifera)* had invaded the precious patch of Peach Heath, and I spent an hour clearing them out (also much Panic Veldt Grass); a blue-tongue lizard was disturbed in the process. There was no sign of either recently recorded Mosquito Orchid or Slender Sun-orchid, nor of any fern other than bracken.

As in all other visits to these beautiful stretches of the Yarra, one was sickened and depressed by evidence of much continued rubbish dumping, especially along that steep section of river bank west from the new Eastern Freeway bridge. Hereabouts the surviving colonies of Golden Everlasting, Sticky Boobialla, Clematis, Chocolate Lily, Dianella and other attractive natives were being smothered by a deluge of old mattresses, garden refuse, chunks of cement, plastic bags, bottles, cans, cartons etc. — if only such insensitive people could be caught and dealt with by the law!

* 102 Male Street, Brighton, Victoria, 3186.

Here are my additions and amendments to the checklist as published in July/August 1982.

Additional Records

Agropyron scabrum
Common Wheat-grass
Dichelacne crinita
Long-hair Plume-grass
Stipa pubescens
Tall Spear-grass
Cyperus tenellus
Tiny Flat-sedge
Scirpus marginatus
Club-rush
Carex inversa
Sedge
Pelargonium australe
Austral Stork's-bill
Callistemon paludosus
River Bottlebrush

Note (p. 150) — *Spergularia rubra* and *Lepidium africanum* (non *"L. hyssopifolium")* are now both regarded as naturalized alien species and should be deleted from the checklist.

Typographical Slips

p. 150
— for *"Rhangodia"* read *Rhagodia;*
— for "RUNUNCULACEAE" read "RANUNCULACEAE";
— for *Crassula "sieberiana"* read *C. sieberana*

p. 151
— for *Acacia "phycnantha"* read *A. pycnantha*

Nomenclatural Changes

p.149
— for *Poa australis* read *P. labillardieri* and *P. sieberana;*
for *Danthonia purpurascens* read *D. tenuior*

p. 150
— for *Stipa variabilis* read *S. falcata;*
for *Rhagodia hastata* and *R. nutans* read *Einadia hastata* and *E. nutans;*
— for *Crassula macrantha* read *C. decumbens.*

p.151
— for *Acaena anserinifolia* and *A. ovina* read *A. novaezelandiae* and *A. echinata.*

Thesium australe R. Brown (SANTALACEAE) — Field Notes and Observations

BY W. R. ARCHER*

Introduction

Thesium australe is an insignificant-looking plant allied to *Exocarpos* (Ballart), with the rather uninspiring common name of Austral Toad-flax. It has slender, wiry branches and dull grey to yellowish-green linear foliage with tiny pale five-petalled axillary flowers. It is a low herb which grows from a central rootstock upwards and outwards, resting against or on top of surrounding vegetation, and leads at least a partially parasitic existence by having small, cup-like appendages which are attached to the roots of other plants. However, it does not seem to be selective and appears to have little effect upon its hosts.

Range and Abundance

This inoffensive little plant, restricted in habitat to grassy plains and sub-alpine herbfields, was once very common and widespread through Victoria, having been recorded from Wando Vale near Casterton in the south-west, Lancefield north of Melbourne, north-east Victoria and East Gippsland (Willis, 1972). It was also recorded in Tasmania last century from the valley of the Derwent River — where it is now possibly extinct (Curtis, 1967), New South Wales — where it is classified as rare and has not been recorded in recent years (Beadle, Evans and Carolin, 1972), and in Queensland — where the current status is unknown.

Despite extensive searching by various bodies and organisations, the only recent records are from sub-alpine herbfields in north-east Gippsland, west of Wulgulmerang and Butchers Ridge. Here only a few colonies in four locations are known to exist as follows:

(1) Gillingal Station, private property west of Butchers Ridge: several colonies totalling 500 to 1000 plants recorded in March 1980 (N. H. Scarlett, *pers. comm.*). Current status is unknown.
(2) First Emu Plain, Crown land west of Wulgulmerang off the Black Mountain Track: one colony of 100-500 plants recorded in February 1980. Current status is unknown (Scarlett, *pers. comm.*).
(3) Small plain, Crown land dissected by creek situated between First Emu Plain and Rocky Plain: six colonies totalling 4520 plants recorded in December 1981, reduced to less than 1300 plants by January 1983 and 140 plants by March 1983.
(4) Rocky Plain, Crown land off Black Mountain Track: two colonies, one of 100 plants recorded in February 1980 (Scarlett, *pers. comm.*), with the second colony of 12 plants recorded in February 1982. Each colony was reduced to less than six plants by December 1982.

Another colony was recorded on Native Dog Flat also off Black Mountain Track in the late 1960s (J. H. Willis, *pers. comm.*) but has not been sighted since. A colony was also recorded on Mt Hamilton (National Herbarium, Victoria MEL 1506944 — coll. Beauglehole, 1971) but despite two searches by Scarlett, it has not been possible to relocate it.

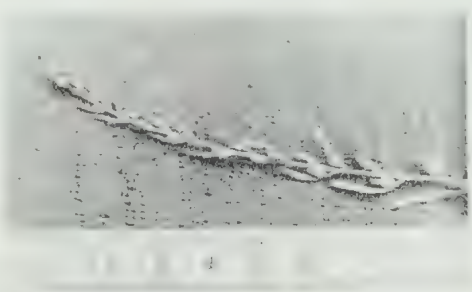

Fig. 1. *Thesium australe*.

* P.O. Box 300, Rosebud, Victoria, 3939.

The question that must be asked is why such a once common and widespread plant should be contracting geographically and numerically. Scarlett and Parsons (1982) discuss this phenomenon for other Victorian grassland plants and indicate that the reasons may be many and varied. In this article the progress of the six colonies on the small plain between First Emu Plain and Rocky Plain is documented to indicate the plight of *Thesium australe* in this part of Victoria, which is possibly similar to what has occurred elsewhere in Australia.

Habitat and Site History

The recorded site history of this particular area commenced in December 1979 when the vegetation was about one metre high and dominated by *Hakea microcarpa, Leptospermum myrtifolium, Callistemon sieberi* and *Epacris microphylla*, these being surrounded and mixed with low herbaceous plants and grasses. *Thesium australe* was not noticed at this time.

During the autumn/winter period of 1980 the area was burnt by the Forests Commission Victoria to reduce the fire hazard, as is the practice here every few years. This resulted in a prolific herbal flower display the following December, predominantly of *Stylidium graminifolium, Bulbine bulbosa, Arthropodium milleflorum* and *Hypoxis hygrometrica*. The various shrubby plants had also started to reshoot from the base of their blackened skeletal remains, indicating the fire had not been sufficiently intense to kill them. Again *Thesium australe* was not sighted but it is probable that germination had begun.

It was not until December 1981 that the six colonies of *Thesium* (denoted A to E) were discovered strung along the small creek. Colonies A, A1, B and C were on the south side of this creek. Colonies A and A1, located to the east in the same small herbfield and largely surrounded by drier rocky ground, were connected by a narrow grassed section to a larger, elongated grassed area 200 metres to the west where colonies B and C were located, separated from each other by a drainage/seepage area. Colonies D and E on the northern side of the creek were on the edge of a much larger herbfield and were located opposite colony C.

Thesium plants varied in size from less than 100 mm to over 600 mm, spreading up and over the other herbal vegetation. The total population was estimated to be 4520 plants, which were found growing in open grassy sections, beneath shrubby plants and beside partly exposed rocks. At all sites the drainage was good, with the soils becoming quite moist in the wetter months.

Methods

To accurately re-locate the colonies, rocks were placed on their outer perimeters and within 300 mm of a *Thesium* plant. Scale drawings were made, copies of which have been lodged at the Botany Department, La Trobe University, Bundoora, Victoria.

Plant numbers were initially estimated by counting the plants in five one-square-metre segments taken randomly in each colony, then multiplying the average plant count per square metre by the total area of the colony. Later, when plant numbers were considerably reduced a metre-wide transect through each colony was required for accuracy. Both methods of estimating were checked and verified at the time by extensive counting of much larger areas within each colony.

Observations

The account below is based mainly on several visits of one to three weeks duration over a 15-month period. Thus the interpretation of causes of plant death from agencies like cattle, horse, rabbit and grasshopper grazing relies partly on circumstantial evidence. Where *Thesium* survival is concentrated beneath and near associated shrubs, it is

believed that this is due mainly to protection from grazing animals rather than protection from frost for reasons given below when discussing colony E.

Colonies A and A1: By December 1982 colony A was totally annihilated and colony A1 almost so, with the one remaining plant being protected by a dense thicket of shrubby plants on three sides and a boundary rock on the fourth. Grazing animals had closely cropped all edible vegetation including plants growing under the larger bushy shrubs, indicating small grazing animals had at least been partly responsible. Droppings indicated that cattle, wild horses, rabbits, kangaroos, wallabies and wombats had used the area, with rabbits still active. By March 1983 the last plant had disappeared.

Colony B: The habitat on this site included partly exposed rocks, low shrubby plants like *Epacris microphylla*, taller shrubs and open grassed areas. *Thesium* was initially found growing in all sections but during 1982 most plants from the grassed areas had disappeared, leaving those with the greatest natural protection.

Animal species grazing this site were much the same as had grazed colonies A and A1 except that the resident rabbit population here was greatly reduced, possibly due to a myxomatosis outbreak in February 1982. Colony B and the other colonies also differed from A and A1, being part of a much larger herbfield where grazing animals could disperse, thus reducing the grazing pressure.

Colony C: This colony, which had the highest percentage survival in January 1983, also occupied the largest area, was the most lightly populated (initially averaging only one plant per two square metres), and had the greatest number of large shrubby plants. These, although well-spaced, offered good protection from the larger grazing animals. The rabbit population had also been considerably reduced. By March 1983 however, the percentage survival had dropped from 75 per cent to 5 per cent.

Colony D: Colony D occupied the smallest area and had the highest density of *Thesium australe* (initially ten plants per square metre). The site was well covered with partly exposed rocks, low shrubby and taller bushy plants and was situated on the northern side of the creek, which served as a barrier to some animals, particularly rabbits. An extensive herbfield immediately to the north of the colony encouraged grazing animals to disperse.

Rabbits here occupied the drier ground on the far side of the herbfield and tended to feed closer to that side because it offered them greater cover and protection. One rabbit did construct a burrow quite close to the colony in February 1982 but did not remain long, so damage to colonies D and E from this source was light.

The larger animals such as wild horses and cattle favoured the larger herbfield and most would cross the creek where a gap occurred in the *Leptospermum grandifolium* thicket at the rear of colony D, thus passing through the centre of the colony and causing much of the recorded damage by trampling.

Colony E: This colony, also with the creek to one side, was subject to similar pressures to colony D except for the absence of concentrated stock movement through its centre. The environment was quite different, however, being an open grassed area with very few shrubs, rocks or natural cover.

During the 1982 summer/autumn period, cattle numbers in the district were light and the herbfield was hardly used by them. This, coupled with the light grazing of rabbits, meant that the main decline in *Thesium australe* numbers to December 1982 could be attributed to the resident wild horse population. In the early part

Table 1. *Thesium australe* population counts.

Colony	Dec. 1981	Dec. 1982	12 month survival rate	Jan. 1983	13 month survival rate	March 1983	15 month survival rate
A	700	nil	nil	nil	nil	nil	nil
A1	20	1	5%	1	5%	nil	nil
B	600	180	30%	180	30%	20	3%
C	400	300	75%	300	75%	20	5%
D	1000	700	70%	573	57%	100	10%
E	1800	1300	72%	243	14%	nil	nil
Total	4520	2481	55%	1297	29%	140	3%

Note: Percentage figures taken to the closest whole number.

of 1982 this population comprised ten horses which, in small groups, grazed various herbfields within an area of six square kilometres. The native grazing animals would, no doubt, have had some effect on the *Thesium* population but their numbers in this district are small and their effect would be insignificant. Likewise the adverse weather conditions during 1982 with severe frosts and a very dry spring had little effect on the *Thesium* population. Individual plants appeared remarkably healthy, and showed no sign of enviromental stress when viewed in December 1982.

By early December 1982, because of severe drought, cattle were being brought into the area in larger numbers than usual and grazing on all herbfields became intense. Horses still grazed the area and their effect can be gauged from the decline in plant numbers during the December 1981 to December 1982 period. However, the serious decline in *Thesium* numbers from December 1982 to January 1983, particularly in the open grassed area, is thought to be largely due to grazing cattle. Their effect on this colony was more serious than the results indicate, as most of the surviving plants were little more than shortened stalks, and had a limited chance of surviving the summer and further heavy grazing. Grasshoppers and possibly other insects added to the grazing pressure and by March 1983 the colony of 1800 plants recorded 15 months previously had entirely disappeared.

Summary

Grazing effects December 1981 to January 1983. The reduction of *Thesium australe* in the six colonies was due to a variety of factors and not to any single cause. Colonies A and A1 were lost because of heavy grazing by various animals on a somewhat isolated herbfield. The resident rabbit population in particular had a severe effect because it grazed beneath the larger, more bushy shrubs which had afforded the *Thesium* plants some protection from larger grazing animals.

In colonies B, C and D most of the plants lost grew in open areas with little or no natural cover or protection. The survivors were greatly assisted by being located in a much larger unfenced grazing area, where the animals could disperse, thus reducing the concentrated effects of trampling and grazing. Had the animals been confined or alternate grazing areas been less available, or had the rabbit numbers been higher, the results could have been far worse.

The demise of colony E was due to the grazing pressures of cattle and, to a lesser degree, wild horses. The site, in an open

grassed area, offered little natural protection. This coupled with the growth habit of *Thesium australe* to rest on top of or against the surrounding vegetation, made it very susceptible to grazing by the larger animals, which not only ate the *Thesium* plants but tended in the process to uproot them or break them off at ground level.

Grazing effects January to March 1983. In two months the total survival rate dropped from 29 per cent to 3 per cent. Cattle and wild horses had continued to graze the area inflicting further damage. However, the *Thesium* population had encountered a new threat which although difficult to assess accurately, may have completed the coup de grace for the severely depleted *Thesium* colonies.

This, until now unapparent, *Thesium* consumer was the grasshopper, and all of the surviving plants had been grazed by them and possibly other insects. Grasshoppers are a common sight on the herbfields during summer, and although to a casual observer their numbers did not seem to be any greater in 1983 than previously, what had obviously changed for them was the availability of food. Drought had limited the appearance of ephemerals, and heavy grazing had reduced other herbaceous plants, which in turn may have caused the grasshoppers to feed on less favoured vegetation, or simply to consume what the larger grazing animals had not. In any event the grasshoppers alone cannot be blamed for the demise of *Thesium australe*; they were only the final link in a chain of unfortunate circumstances related to feral animals and land management which have beset this rare and endangered species.

Conclusion

The survival of *Thesium australe* is currently a matter left very much to chance. Its future is greatly influenced by the size and composition of its habitat and the type of grazing pressures placed upon it. Land mangement agencies could greatly assist in protecting this species if grazing by cattle was stopped or closely controlled. Similarly, greater control of rabbits and wild horses would increase the chances of *Thesium* colonies surviving.

The use of fire as a mangement tool to maintain *Thesium* colonies requires careful investigation. The frequency and intensity of the fires could be planned to encourage seed germination of *Thesium*, reduce undesirable plant species, and allow the growth and survival of some larger plant species which could offer protection from grazing.

Acknowledgements

I am indebted to Dr R. F. Parsons and Mr N. H. Scarlett of the Botany Department, La Trobe University, who have readily made their knowledge and resources available, and without whose enthusiasm and interest this article would not have been written.

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Four New Caddis-fly Species from Victoria (Trichoptera: Insecta)

By Arturs Neboiss*

Introduction

The continuation and expansion of ecological studies of Victorian stream systems during the last decade rapidly increased the information on aquatic insects and their importance as water quality indicators. Although the majority are well known, occasional undescribed species are found. In this paper four such species are described, representing three families of Trichoptera.

The entire material, including the type specimens, is deposited in the Museum of Victoria collection unless indicated otherwise. Dissected and figured specimens are identified by the author's notebook number with the prefix "PT-".

Descriptions

Family CALOCIDAE

Tamasia acuta sp. n. (Figs. 1-4)

Adults dark, blackish brown with some irregular pale spots on forewing; first antennal segment long, anteriorly with large digitiform process; maxillary palpi 4-segmented in male, the two distal segments expanded, subequal, mesally covered with long pale hairs.

Male genitalia with superior appendages proportionally larger than in *variegata* Mosely; mesal incision to segment 10 reaches nearly to the base; phallus smooth, without a group of external spines near the apex.

Female abdomen with end segment bluntly rounded; the dorso-ventrally more elevated basal end of the sclerotized vaginal structure, visible only in cleared preparation separates this species from *variegata;* discoidal cell in hindwing proportionally larger, with cross-vein r-m directly below the cross-vein closing discoidal cell.

Length of anterior wing: ♂ 6.5-8 mm; ♀ 7.5-8.5 mm.

Type material: HOLOTYPE ♂; Victoria, Matlock Creek off Thomson Portal road, 14 km W of Aberfeldy, 10 Feb. 1977, A. Calder; paratypes 20♂ 20♀ collected with holotype (specimen PT-1177 ♂ figured); paratypes 5♂ 5♀ also deposited in the Australian National Insect Collection, Canberra.

Other material examined: Victoria — Yea River nr Glenburn; Snobs Creek Falls; Jordan River nr Jericho; Toorongo River Falls nr Noojee; Kinglake National Park; Murrindindi River-Falls Creek junction; Cumberland Falls, SE of Marysville; Ovens River nr Porepunkah; Howqua River nr Timbertop; Errinundra River; Cann River nr Noorinbee. New South Wales — Khancoban.

Distribution: Central and eastern Victoria; SE-New South Wales.

This species is very similar to *Tamasia variegata* Mosely, originally described from Tasmania, but later also recorded from Victoria (Neboiss, 1977). Large numbers of specimens from numerous Victorian localities were examined confirming that besides *variegata* another quite distinct species is present and confused with it. These two species — *variegata* and *acuta* are separated by the differences in male maxillary palps, structures in male genitalia and some differences in wing venation. Separation of females is somewhat more difficult.

Tamasia variegata Mosely (Figs. 5, 6)

The separation of this species is possible by the characteristic shape of male maxillary palpi (Mosely and Kimmins, 1953), details of male genitalia (figs 5, 6)

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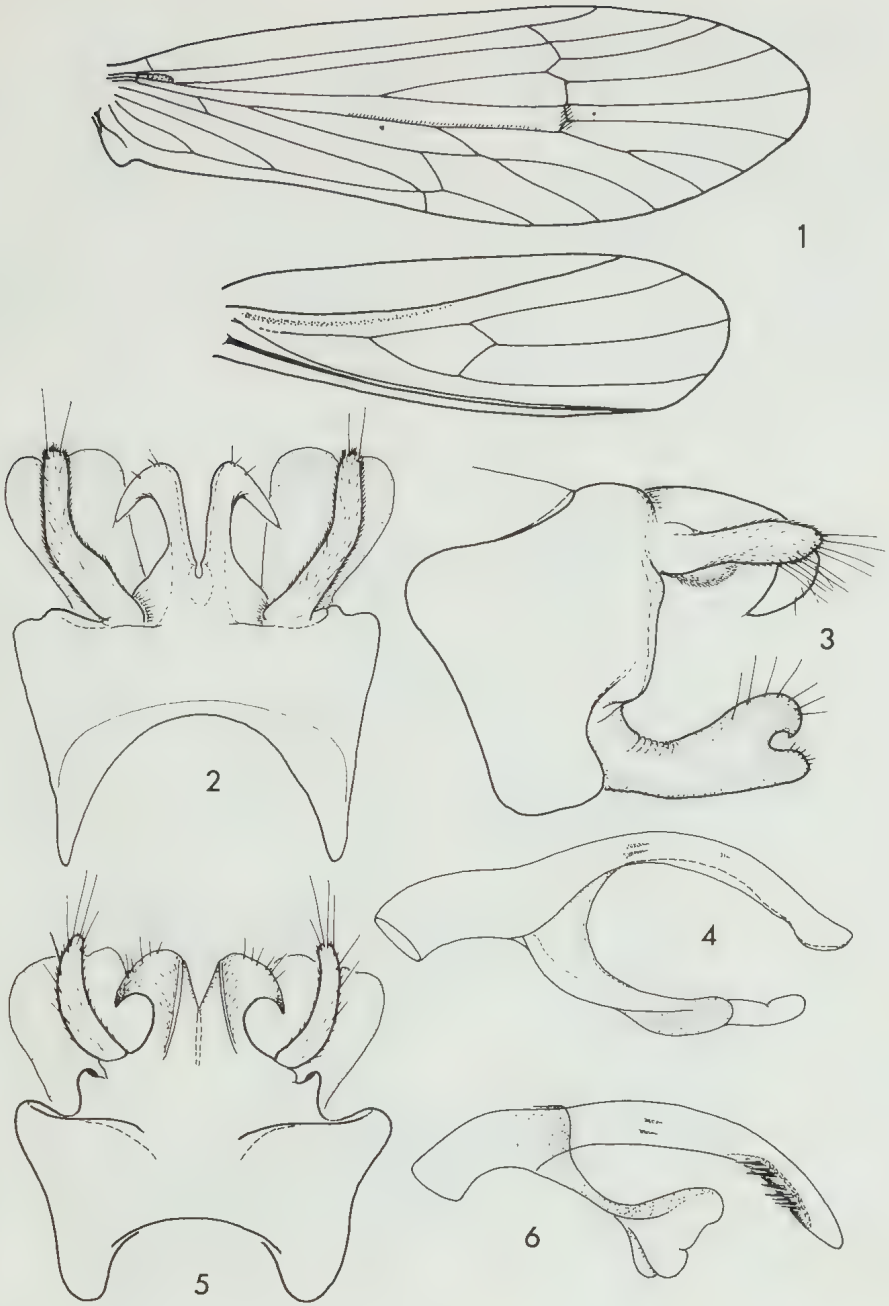


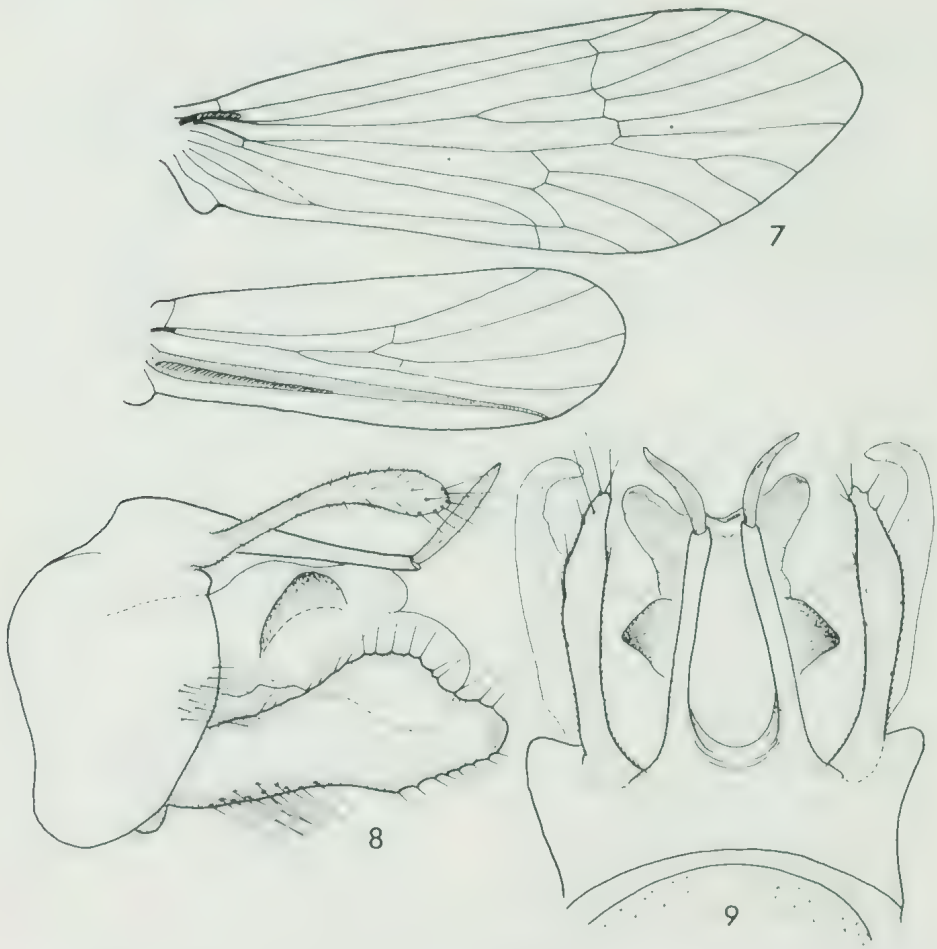
Figs. 1-4. *Tamasia acuta* sp. n. male; 1, wing venation; 2, genitalia dorsal; 3, genitalia lateral (phallus omitted); 4, phallus lateral.
Figs. 5, 6. *Tamasia variegata* Mosely, male; 5, genitalia dorsal; 6, phallus lateral.

and wing venation; the separation of females is possible from hindwing venation, with small discoidal cell and distally situated cross-vein r-m; the sclerotised internal vaginal structure only slightly elevated at basal end.

Length of anterior wing: ♂ 6.5-8 mm; ♀ 7.5-9 mm.

Type material: TYPE o, Tasmania, Miena, Great Lake, Dec. 1930, C. Parker (British Museum Nat. Hist. London).

Distribution: Tasmania — widespread; Victoria — Gellibrand River and tributaries; Elliott River nr Apollo Bay; Carisbrook Falls nr Apollo Bay; Mt. Langi-ghiran nr Ararat; Yea River nr Glenburn; Flowerdale; Kinglake National Park; Little River nr Taggerty; Delatite River; Strathbogie; Tanjil River nr Moe; Upper Buckland River; Eucumbene River nr Kiewa; Albert River nr Hiawata; Flynns Creek nr Callignee; Middle Creek nr Boolara. New South Wales — Upper Allyn River nr Eccleston; Styx River nr Ebor. Queensland (SE) — Browns Falls nr Killarney.



Figs. 7-9. *Tamasia furcilla* sp. n. male; 7, wing venation; 8, genitalia lateral; 9, genitalia dorsal.

Tamasia furcilla sp. n. (Figs. 7-9)

Adults dark brown to blackish, in the middle of forewing basal to anastomosis a pair of pale spots, the anterior one on costal margin triangular or somewhat oval, the posterior one somewhat squarish; some small indistinct spots obliquely across the wing at anastomosis with one more distinct spot near stigma. Maxillary palpi in male with two apical segments elongate; first antennal segment long, with anterior digitiform process as well as with postero-mesally directed process near base and a shorter one at middle.

Male genitalia with superior appendages long, expanded shortly before tapering apex; tergite 10 terminates into a pair of two-segmented slender processes; inferior appendages expanded at apical third, tips curved inward; phallus with a pair of sclerotized lateral flanges.

Female similar to *acuta*, but with distinct wing pattern, similar to that described in male.

Length of anterior wing: ♂ 7-7.5 mm; ♀ 8 mm.

Type material: HOLOTYPE ♂: Victoria, Mt Buller Road, White bridge, 20 Dec. 1972, P. Zwick; paratypes 3♂ 1 collected with holotype; genitalia preparation PT-1190♂figured. Habitat: small, cool fast flowing mountain creek.

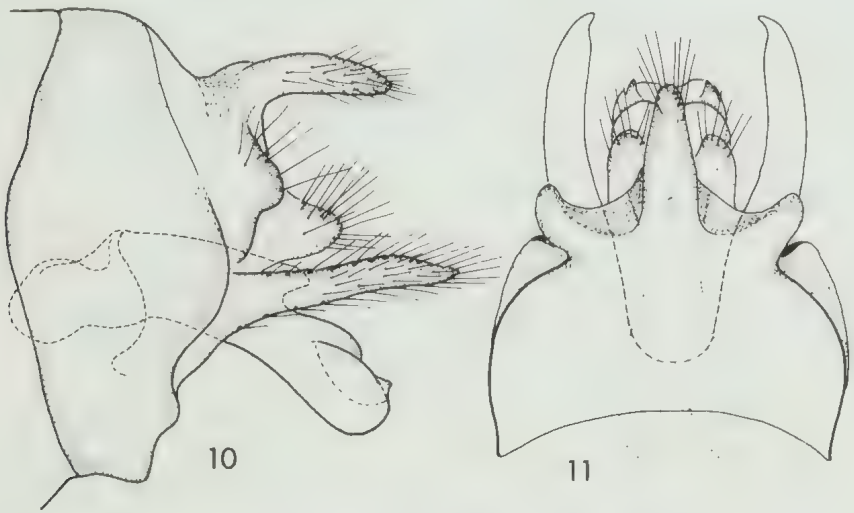
Distribution: Central Victoria.

Family KOKIRIIDAE

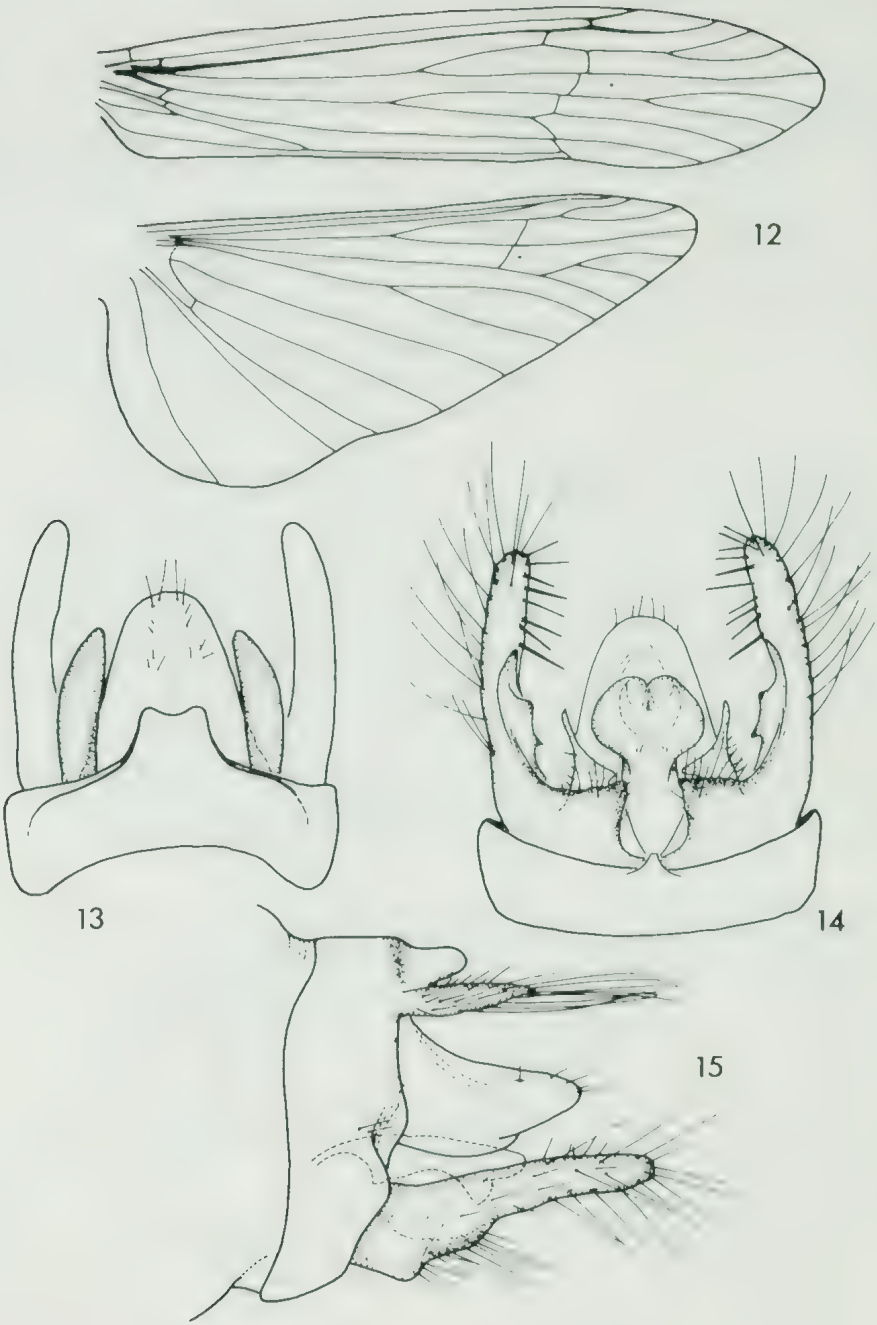
The only location where this family has been found on the Australian continent is a small restricted area at Tanjil-Latrobe River junction, Victoria (Neboiss, 1974); all other records of the family are from South-west Tasmania (Neboiss, 1977). The discovery of a second species in Victoria is of particular interest, because it represesnts a Tasmanian genus *Taskiria* Neboiss and the locality is in the Otway ranges.

Taskiria otwayensis sp. n. (Figs. 10, 11)

Head with two pairs of setiferous warts; frons slightly produced, bluntly rounded, covered with coarse upcurved hairs; labial palpi 3-segmented, positioned horizontally just below the head, directed anteriorly, apical segment thickened; maxillary palpi 3-segmented, arising from apex of the extended mouth parts, terminal segment slightly longer than segment 2. Wings densely covered with brownish pubescence; thyridial cell longer than discoidal cell.



Figs. 10, 11. *Taskiria otwayensis* sp. n. male; 10, genitalia lateral; 11, genitalia dorsal.



Figs. 12-15. *Notalina gungarra* sp. n. male; 12, wing venation; 13, genitalia dorsal; 14, genitalia ventral; 15, genitalia lateral.

Male genitalia with tergite 10 digitiform, slightly downturned apically, lateral lobes short; inferior appendages rather slender, apices pointed, curved inwards; phallus robust, in lateral view with short dorsal projection, curved downward, apex rounded.

Female unknown.

Length of anterior wing: ♂ 11 mm.

Type material: HOLOTYPE ♂: Victoria, Charley's Creek, 5km S of Gellibrand, "Victree" pine plantation, 29 Jan. 1982, A. Neboiss (at MV-light); genitalia preparation PT-1087 ♂ figured. The stream is small, moderately fast flowing, the upper section partly situated in native bushland, followed by pine plantation, mostly overgrown by blackberries and heavily silted bed.

Distribution: Victoria (Otway ranges).

Family LEPTOCERIDAE

Notalina gungarra sp. n. (Figs. 12-15)

This species could not be accommodated in either *Notoperata* or *Notalina* (Neboiss, 1977) without certain objections. Both the wing venation and the male genitalic structures show characters of both genera.

Most wing characters are similar to those found in *Notoperata* and include the short thyridial cell in the forewing; hindwing with distinct fork 1 and short discoidal cell; yet the basally directed oblique angle of cross-vein closing discoidal cell and cross-vein r-m, as well as their separation from the base of fork 3 in the hindwing are typical of *Notalina*.

In male genitalia the shape of tergite 10 in lateral view is more like that found in *Notoperata*, but the single segmented inferior appendages with mesally projecting, bipointed ridge is clearly resembling *Notalina*. The species is thus provisionally placed in the genus *Notalina*.

Male genitalia with centre of distal margin of tergite 9 produced into a distinct projection, somewhat angular in dorsal view; tergite 10 elongate oval, without mesal cleft, depressed in lateral view; superior appendages shorter than tergite 10, tapered apically; inferior appendages with angular projection at base; inner margin with short, bluntly bipointed ridge; mesally at the base arises apically tapered lobe; phallus in ventral view straight, apically expanded into rounded knob.

Length of anterior wing: ♂ 11.5-12 mm.

Female unknown.

Type material: HOLOTYPE ♂: Victoria, Wongungarra and Crooked River junction, 9 Feb. 1981, J. Blyth; paratype 1 ♂ collected with holotype; genitalia preparation PT-737 ♂ figured.

Distribution: Victoria — East Gippsland.

Acknowledgements

The author gratefully acknowledges the support received from the State Rivers and Water Supply Commission of Victoria for the Gellibrand River study and to Mr Ken Lane of Victree Timber Products Ltd., Colac for cooperation and permission to operate a light trap in their plantation territory.

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Some Effects of Drought, Bushfire and Floods on the Otway Coast of Victoria

By Edmund D. Gill*

It has often been argued whether the greater changes to the terrain are caused by the continuous small changes, or by the single impressive cataclysmic events that suddenly alter everything. Probably the answer varies according to the type of terrain, but certainly the changes to the Otway coast between Airey's Inlet and Lorne as a result of drought, bushfire and flood are very impressive. Over the dry years of 1981-1983 the steep forested slopes of the Otway coast in Bass Strait accumulated a vast quantity of dry fuel. Then disaster struck on Ash Wednesday, February 16th, 1983, when bushfires raged along this coast. Many homes were destroyed, and the forest was completely burnt out so that only the trunks of trees stood gauntly across the steep terrain (Fig. 1).

When the drought broke, and torrential rain fell, the waters rushed down the unprotected slopes where usually the rain is filtered through thick vegetation. Torrents filled the steep stream beds, and the rushing waters strongly eroded the courses, sweeping the masses of logs and thick branches left from the bushfire downstream to the sea, where they littered the beaches.

Cinema Point (Fig. 1)

In the foreground can be seen burnt

*1/47 Wattle Valley Road, Canterbury, Victoria, 3126.

Fig. 1. Photograph from Cinema Point on the Great Ocean Road looking N.E. The estuary of Grassy Creek is filled with sand accumulated during the drought. Beyond is Point Castries with Last Interglacial shore platform at + 7 m. To the left is the Great Ocean Road. Photo: E. D. Gill.

Fig. 2. Photograph of terrace above the Grassy Creek floodplain covered with sand blown up from the shore during the drought. The flood that followed the drought swept the sand out to sea again. Photo: N. H. McNeill.

houses. The fires extended as far as the eye can see, and beyond that. Behind the viewer, the fires extended right back to Lorne. After the bushfire it was possible to see in detail the geomorphology of this landscape previously completely hidden by the forest. The terrible devastation had one redeeming feature in that it became possible to understand the landscape as never before. Depressions along faults were recognized, outcrops of rock were seen for the first time, and other features previously screened by the forest cover came into view.

The trunks of the trees on the coastal slopes were smaller than were to be seen inland. This has been attributed to salt from the ocean holding back growth, but photos celebrating the jubilee of the Great Ocean Road show that the slopes were cleared when the road was built.

Grassy Creek (Figs. 1-2)

During the drought the estuary of Grassy Creek was filled with sand 1-2 m thick. Normally water coming down the creek washes out any sand blown into it from the shore. However, as its flow was reduced to virtually nothing during the drought, the marine energies triumphed over the riverine energies. Sand thrown up by the waves was blown up the estuary (Fig. 1). At the inner end of the estuary there is an alluvial terrace about 1.5 m above the present creek floodplain, and this also was covered with sand (Fig. 2). When the drought broke, a torrent came down Grassy Creek, sweeping away the bridge on the Great Ocean Road, and sweeping the sand out to sea. These observations show that normally there is an equilibrium between the sea and the creek, but this failed to operate when the creek dried up.

Cumberland River

At Lorne, logs brought down by the Erskine River littered the beach when the drought broke. As this is an important tourist centre, the logs were heaped on the beach and burnt. At the Cumberland River, S.W. of Lorne, where no action was taken, it was possible to see the full cycle of events. When the torrent came down after the drought it swept caravans from the camping ground downstream and they crashed into the bridge on the Great Ocean Road. Boulders and pebbles swept down the river accumulated in the lower intertidal zone whereas the flotsam (logs and branches) entirely covered the rest of the beach. With time the wood was carried up into the supratidal zone. Much was taken away for firewood and much used for bonfires on the beach. However, it was not long after the flood before there were three distinct zones on the beach, viz. the pebbles in the lower tidal zone, a band of beach sand, and then the wood in the highest zone.

Later, when big swell waves came in they combed sand off the beach and revealed a supratidal boulder bed at the back of the beach. Gradually the boulders and pebbles left near low tide by the river flood were transferred back up the beach to this supratidal boulder bed. This bed is often called a storm beach, but it is not due to local storms. It is only when there are very large swell waves (Gill, 1976) that there is enough energy to transfer these heavy boulders to the supratidal zone.

So at the mouth of the Cumberland River also the interplay between the ocean and river energies was displayed. The flood following the drought threw many things out of place. Gradually a new state of equilibrium is being established. Because the swell is from the south-west, the boulders collect on the N.E. side of the river. Up the estuary near the bridge there is a relict boulder bed overgrown with vegetation. I think this was built in the same way but thousands of years ago when sea level was a little higher. No doubt the bed was once much higher but from time to time when unusual floods (such as those after bushfires) occurred, they have washed pebbles down and recycled them into the contemporary beach.

In the roadside cuttings an emerged shore platform at 7 m can be seen, and on it are great numbers of boulders. Erosion causes these boulders also to be recycled. As on the modern beach, there is a big boulder deposit on the N.E. side of the river and only a small one on the S.W. side. The age of the emerged boulder bed is Last Interglacial.

REFERENCE

Gill, E. D. (1976). Large waves at Lorne, Victoria. *Victorian Nat. 93:* 216-220.

Observations of Native Mammals Wintering above the Snowline in the Victorian Alps

By Charles Meredith*

While it is well-known that some small ground-dwelling mammals are active throughout the winter in the alpine areas of Australia (Calaby and Wimbush, 1964; Dickman *et al*, 1983; Dixon, 1978; Osborne *et al*, 1978), utilising the relatively warm and protected air space beneath the snow cover, there are few published records of mammals overwintering above the snow-line in Victoria. This note sets out observations of five species of native mammal in snow conditions in the Victorian alps. Some of the observations were made while participating in fauna surveys of the Mt. Timbertop region (Nicholls and Meredith, 1984), others while working for the Australian Broadcasting Commission Wildlife Film Unit at Mt. Baw Baw, but most were made during recreational ski-touring trips.

Common Wombat *(Vombatus ursinus)*

Wombats are common in sub-alpine Snow Gum *(Eucalyptus pauciflora)* woodland and remain active during the winter. I have observed their tracks in the snow on almost every trip, but have never recorded them venturing above the tree-line, although they do frequently leave the Snow Gums and cross sheltered snow plains in order to visit streams. When the snow cover is deep, the few locations where a stream is not completely snowed over are focal points, with often three or four sets of wombat tracks converging on them. Seven sets were noted once in deep snow conditions, leading to the only patch of open water that had been seen all day. I do not know whether wombats visit these streams to drink; they certainly feed on the exposed vegetation along the banks.

* Department of Zoology, Monash University, Clayton, Victoria, 3168.

Wombats were often active during the day at times of heavy snow cover, mainly in the afternoon, as was also noted by Osborne *et al* (1978). This may indicate that a longer time must be spent in order to locate exposed vegetation under snow conditions or it may perhaps be a response to the difficulty in feeding once the snow has iced over at night. Alternatively, a longer foraging time might be required to provide a greater food intake in order to maintain body temperature. Observations of several wombats at Mt. Baw Baw over ten days in late winter showed that immediately the thaw began and the snow cover became patchy, the animals reverted to a completely nocturnal activity pattern.

When walking in soft snow, wombats are hampered by their short legs and can present quite a comical sight. They move slowly and deliberately, placing their feet down gingerly and appearing to pack the snow before placing much weight on it. When going downhill, the forefeet are placed well forward and are used to prevent the animal sliding on its stomach. However, if the snow is too soft or the slope too steep a slide is inevitable and the resulting broad "wombat-chutes" are regularly seen in the snow.

Common Ringtail Possum
(Pseudocheirus peregrinus)

One Ringtail Possum was seen four metres up in the branches of a Snow Gum at Macalister Springs (Mt. Howitt) at 0930 on the 18 July 1977. There was about 1m of snow. The previous day, fresh possum droppings had been noted below a Snow Gum at the Howitt High Plains.

Dusky Antechinus *(Antechinus swainsonii)*

Ten Dusky Antechinus were caught

during trapping beneath 60cm of snow on The Bluff in August 1973, in alpine heath; six in Snow Gum woodland, and two in Alpine Ash *(Eucalyptus delegatensis)* forest, from 415 trap nights.

Brown Antechinus *(Antechinus stuartii)*

Several of this species were caught in 20cm of snow at King Saddle (Mt. Stirling) in August 1973. In September 1974 and August 1977, Brown Antechinus were common in several mountain huts visited, though none had been noted in these huts during frequent summer visits.

Southern Bush Rat *(Rattus fuscipes)*

Ten Bush Rats were caught from 40 trap nights in 30cm of snow near the summit of Mt. Stirling in August 1973. Seventeen were caught in alpine heath and Snow Gum woodland on The Bluff also in August 1973, from 313 trap nights.

Discussion

The only other general survey of Australian mammals above the snowline in winter, that of Osborne *et al* (1978) at Gungarten in New South Wales, recorded the same species as did this study. Both the Broad-toothed Rat *(Mastacomys fuscus)* and the Mountain Pigmy Possum *(Burramys parvus)* have also been noted as active in the subnivean region in winter (Calaby and Wimbush, 1964; Dixon, 1978). Thus, with the exception of bats which have not been noted above the snowline, the native mammal fauna of the Australian alpine areas appears to remain active throughout the year.

Dickman *et al* (1983) suggest that competition between *Antechinus swainsonii* and *A. stuartii* is increased when they are forced together in the subnivean region at times of heavy snow cover, to the disadvantage of *A. stuartii*. In this context it is interesting to note the influx of *A. stuartii* into cattlemen's huts in such conditions, which may represent an attempt to avoid *A. swainsonii*.

REFERENCES

Calaby, J. H. and Wimbush D. J. (1964). Observations on the broad-toothed rat *Mastacomys fucus* (Thomas). *CSIRO Wildl. Res. 9:* 123-133.

Dickman, C. R.; Green, K., Carron, P. L., Happold, D. C. D. and Osborne, W. S. (1983). Coexistence, convergence and competition among *Antechinus* (Marsupalia) in the high country. *Proc. Ecol. Soc. Aust. 12:* 79-99.

Dixon, J. M. (1978). Mammals of the Australian Alps — a brief review of past work, with a view to the future. *Victorian Nat. 95:* 216-221.

Nicholls, D. G. and Meredith, C. W. (1984). The Native Mammals of the Mt. Timbertop Region, North-eastern Victoria. *Victorian Nat. 101:* 67-73.

Osborne, W., Preece, M., Green, K. and Green, M. (1978). Gungarten: a winter fauna survey above 1500m. *Victorian Nat. 95:* 226-235.

Nominations of FNCV Council Members and Office Bearers

FNCV Annual General Meeting will be held on Monday, 14th May, and nominations are required for Council members. Council consists of the President, Vice-President, Immediate Past-President and ten other persons. The following offices are open for nomination: **President, Vice-President, Secretary, Assistant/Minute Secretary, Treasurer, Assistant Treasurer, Editor, Assistant Editor, Librarian, Assistant Librarian, Excursion Secretary, Programme Secretary, Conservation Co-ordinator, Club Reporter.**

With the exception of the President, Vice-President and Immediate Past-President, Office Bearers are not automatically members of Council, though the Secretary and Treasurer are required to attend Council meetings, which are held on the last Thursday of the month at the National Herbarium. If you nominate a person for a particular office, and that person is willing to be a member of Council, an **additional nomination to this effect is required.** Council is the governing body of your Club. Think now of the people you would like to form this body, and ask them if they will accept nomination.

Nominations, endorsed by two members of the Club, should be received by the Hon. Secretary, Field Naturalists Club of Victoria, c - National Herbarium by **11th May.**

The Club is entitled to three representatives on the Conservation Council of Victoria. We also require an information officer (at General meetings) and a display co-ordinator. If you would like to undertake these jobs, or know of members who would, please let the Secretary know. (Mrs Sheila Houghton, 551 2708 AH).

Attraction of *Heteronympha merope merope* (F.) to an *Acacia* Sap Flow (LEPIDOPTERA : NYMPHALIDAE)

BY KELVYN L. DUNN*

Brunet (1977) recorded a single female of *Heteronympha merope merope* feeding amongst congregating *Polyura pyrrhus sempronius* (F.) at a sap flow exuding from *Polygala myrtifolia* (L.).

In the morning of 30 November 1983, at Shelley Beach near Lake Tyers, Victoria, a number of *H. merope* males were observed by the author feeding at a flow of sap from the trunk of an *Acacia mearnsii* De Wild. Up to five adults were observed at this sap flow at any one time.

When disturbed the butterflies scattered, the majority of which returned to the sap flow almost immediately. A specimen which was removed from the sap flow and released about six metres distant, appeared to fly randomly about in the adjacent scrub. When this seemingly random flight path passed within about two metres of the *Acacia* trunk, the butterfly was observed to spontaneously change direction and fly rapidly and directly to the flow of sap. It then landed and commenced feeding immediately.

Conditions at the time of the observations were still and cool with occasional sunny periods. Specimens of *H. merope* were seen to approach the tree from all directions. The distinctive change in flight behaviour within the two metre radius of the sap flow suggests that the species is responding to a stimulus. *Vanessa itea* (F.), a frequent sap feeder was also on the wing at this locality but was not observed to feed with the *H. merope* at the *A. mearnsii* sap flow.

*Department of Zoology, Australian National University, Canberra, A.C.T., 2601.

REFERENCE

Brunet, B. L. (1977). Observations of the Tailed Emperor *Polyura pyrrhus sempronius* (Lepidoptera : Nymphalidae) in South Australia. *Aust. Ent. Mag. 4(3)*:47-48

Obituary
Paul Genery

Paul Genery, a member of the F.N.C.V. for many years, died on the 24th September, 1983.

He was a professional pharmacist, but had an insatiable interest in nature from the age of fifteen years.

He was a member of the Microscopical Society of Victoria, and when it was incorporated in the F.N.C.V., continued his interest with the microscopical group of that Club.

Paul had an independent but humble nature, and a keen, inquisitive mind, always trying to elucidate the complicated structure and behaviour of pond and river life in particular. His enthusiasm for the subject from personal observation, intensive reading, and correspondence with specialists in the fields of microscopy and aquatic life were of inestimable value to the club, and to anyone who asked his advice on these subjects.

His skill and knowledge were freely shared with many clubs and schools in both the metropolitan and country areas.

In his latter years, Paul concentrated on photographing the "invisible" through his microscopes with a movie camera and analysing the action of the animals in slow motion, which is the only way to learn the involved behaviour of aquatic species. Our members learned a great deal from his screening of these films.

We mourn the loss of a friend, and the club will be poorer because of his passing.

U. BATES

EDITOR'S NOTE: We apologize for the mistake in Mr. Genery's name on p. 255 of November/December 1983 issue.

Naturalist Reviews

Butterflies: A Colour Field Guide

By M. Davarenne. David and Charles, London. 1983. $22.50

Whales and Dolphins of New Zealand and Australia. An Identification Guide

By A. N. Baker Victoria University Press, Wellington. 1983. $12.95.

Two field identification guides have been published recently. These not only deal with completely different groups — butterflies and cetacean mammals — but concentrate on quite different biogeographic zones.

Devarenne's book on butterflies would be a first-rate recommendation for Australian naturalists had it concentrated on local forms. Unfortunately it covers some 300 species from Europe, Northern Africa and parts of Asia. It is, however, an interesting and extremely well structured field guide. An enterprising local entomologist would do well to base an Australian guide on this book's format. All the species presented are photographed in colour. As well, a "pictogram" aids identifcation and gives such additional information as frequency (or rarity), habitat, altitude of occurrence, habits and behaviour (e.g. "friendly" versus "shy" species, "sedentary" versus "migratory" etc.), size, months when the different stages of the life cycle occur, foodplants of the caterpillars and finally, the distribution. All this information is conveniently summarized in a chart which occupies less than half a page! The photographs are excellent (all specimens were living), the glossary and index are well prepared and useful. Although several of the butterflies are in fact found in Australia, I would suggest a somewhat limited market for this book exists in this country.

On the other hand, Baker's *Whales and Dolphins of New Zealand and Australia* is an excellent book which should appeal to many readers — students, naturalists as well as the general public, who will find it "valuable as a practical aid to identification and as a source of useful basic information on these fascinating marine mammals". The soft-covered book is covered in sturdy plastic for protection when in use in the field. There are chapters covering classification, the history of whaling (with some stunning photographs) and cetacean natural history. The latter section attempts to answer some nagging questions: How do whales and dolphins mate? Do they echolocate? Why do whales sing? Do they sleep? Why do whales beach themselves?

As well Baker provides a useful and sensible guide to help people provide aid to stranded marine mammals. This is condensed from a previous publication *The Management of Stranded Marine Mammals* put out by the N.Z. Veterinary Association. It is probably worthwhile to mention here that the Australian National Parks and Wildlife Service have also recently published a "National Contingency Plan for Cetacean Strandings" (Occasional Paper No. 6. Available from ANPWS, Box 636, Canberra City, A.C.T. 2601).

Baker's identification guide itself is accompanied by a preliminary key and a generous supply of photographs or black and white sketches. A selected bibliography follows — interestingly the journal containing the most articles on cetaceans in this list is our own *Victorian Naturalist*.

At $12.95 this guide is excellent value. It has been recommended by the World Wildlife Fund and royalties from its sale contribute towards marine mammal research.

R. WALLIS

SEABIRDS: An Identification Guide.

BY PETER HARRISON

A. H. & A. W. Reed Ltd. $35.00

It is rare for a highly specialised book to be of interest to the average nature lover, but perhaps this one is an exception. Peter Harrison has produced a monumental work in a near pocketable format — an authoritative account of *all* of the world's seabirds, their description, identification and distribution.

Ornithologists with an interest in seabirds will no doubt be aware of this book, but it deserves a wider audience.

The identification of the major groups of seabirds is briefly covered, with a glossary, followed by the colour plates, 88 in all. Each species is well illustrated, with examples of sexual, age and colour morph differences as appropriate. The paintings are uniform in style; detailed, accurate and well printed. The mottled background of some plates is distracting, but otherwise they are very successful. The captions on the opposite page are clear, with the number assigned to each species in bold type, common and scientific names and a sentence or two on key features for identification.

The systematic section which follows the plates is clearly organised in the same numerical order. Information on over 300 species is necessarily brief in a book of this size, concentrating on identification.

It is a pity the distribution maps could not be included with the species descriptions. They are small, but clear and interesting. Probably to reduce costs thay are grouped together (again in the same numerical order) just before the bibliography and indexes of English and scientific names.

Anyone with a passing interest in birds, or anyone else anxious about boredom at sea, could do worse than take along powerful binoculars and a copy of *Seabirds*, even on a day-trip. On a long sea voyage they could prove life savers.

R. GAYMER

Archives

During research into the history of *The Victorian Naturalist*, and the Club generally, some gaps in our records came to light, and although it is unlikely that the early ones can now be filled, we hope that it will not be impossible for the later years.

Does any former Council member possess copies of the Minutes for the following years? If so, the Club would be very pleased to receive them.

May 1887-July 1901
November 1907-March 1913
June 1919-December 1930
October 1954-December 1960
1967-1968
January 1970-January 1975.

The Minutes for meetings between January 1931 and September 1937 have sustained some damage, so we would be grateful for copies covering this period also.

Please address them to the Secretary, c/- FNCV, National Herbarium, Birdwood Avenue, South Yarra, 3141.

FIELD NATURALISTS CLUB OF VICTORIA

Report by Executive Council

In accordance with Section 270 of the Companies (Victoria) Code 1981, the members of the Executive Council submit herewith balance sheet as at 31 December 1983, and statement of income and expenditure for the year ended on that date, and report as follows:—

1. The names of the members of the Executive Council in office at the date of this report are as follows:—

   Miss W. Clark
   Mrs S. Houghton
   Mr D. Dunn
   Miss M. Allender
   Mrs J. Calder
   Mr I. Faithfull
   Miss M. Potter
   Miss C. Shankly
   Mrs H. Stanford
   Mrs H. Weatherhead

2. The principal activities and objects of the Club are to stimulate interest in natural history and to preserve and protect Australian Fauna and Flora. No significant change in the nature of those activities occurred during that period.
3. The net surplus of the Club for the year ended 31 December 1983 was $37 in the General Account. In addition surpluses were earned in the following Funds:—

   Building Fund $1,004, Publications Fund $6,180
   Excursion Fund $3,880 and Special Funds $1,034

4. The following transfers to and from Funds have been made during the year ended 31 December 1983:—

   From Club Improvement Account to General Account Surplus $274
   From Income & Expenditure Account to Club Improvement Account $233

5. The Club has issued no shares or debentures during the year.
6. Before the income and expenditure accounts and balance sheet were made out, the Executive Council took reasonable steps to ascertain what action had been taken in relation to the writing off of bad debts and the making of provision for doubtful debts and to cause all known bad debts to be written off and adequate provision to be made for doubtful debts.
7. At the date of this report the Executive Council is not aware of any circumstances which would render the amount written off for bad debts or the amount of the provision for doubtful debts inadequate to any substantial extent.
8. Before the income and expenditure account and balance sheet were made out the Executive Council took reasonable steps to ascertain whether any current assets (other than those current assets referred to in paragraph (6) were unlikely to realize in the ordinary course of business their value as shown in the accounting records of the Club and, if so, to cause:—
   (a) Those assets to be written down to an amount which they might be expected to realize; or
   (b) Adequate provision to be made for the difference between the amount of the value as so shown and the amount that they might be expected to realize.
9. At the date of this report the Executive Council is not aware of any circumstances which would render the value attributed to current assets in the accounts misleading.
10. At the date of this report there exists no charge on the assets of the Club which has arisen since the end of the financial year and secures the liabilities of any other person and no contingent liability has arisen since the end of the financial year.
11. No contingent or other liability has become enforceable or is likely to become enforceable within the period of twelve months after the end of the financial year which, in the opinion of the Executive Council, will or may affect the ability of the Club to meet its obligations when they fall due.
12. At the date of this report the Executive Council is not aware of any circumstances not otherwise dealt with in the report or accounts which would render any amount stated in the accounts misleading.
13. The Club is prohibited from paying a dividend by its Memorandum and Articles of Association; consequently no dividend is recommended and no dividends have been paid or declared.
14. The Executive Council is of the opinion that the results of the Club's operations during the financial year were not substantially affected by any item, transaction or event of a material and unusual nature.
15. In the interval between the end of the financial year and the date of this report, no item, transaction or event of a material and unusual nature has arisen which is likely, in the opinion of the Executive Council, to affect substantially the results of the Club's operations for the next succeeding financial year.
16. Since the end of the previous financial year no member of the Executive Council has received or become entitled to receive any benefit by reason of a contract made by the Club with him or with a firm of which he is a member or with a company in which he has substantial financial interest.

This Report is made in accordance with a resolution of the Executive Council dated 29th day of March 1984.

W. Clark President
D. Dunn Treasurer

FIELD NATURALISTS CLUB OF VICTORIA
BUILDING FUND

Amount of Fund at 31 December 1982		$7,500
Interest on Investments and Bank Account		1,004
Amount of Fund at 31 December 1983		$8,504

PUBLICATIONS FUND

Amount of Fund at 31 December 1982		$42,999
Interest on Investments and Bank Account		5,955
Surplus (Loss) for the year from—		
Fossil Book	$237	
Ferns of Victoria and Tasmania	82	
Wild Flowers of Wilson's Promontory National Park — Royalties	1	
Birds of Dandenongs	(95)	225
Amount of Fund at 31 December 1983		$49,179

CLUB IMPROVEMENT ACCOUNT

Amount of Account at 31 December 1982	$7,830
Book Sales Account Profit	233
	$8,063
Less — Purchase of Library Books & Equipment transferred to Surplus Account	274
Amount of Account at 31 December 1983	$7,789

EXCURSION FUND

Amount of Fund at 31 December 1982		$7,780
Interest received on Investments & Bank Account	$1,773	
Surplus on Tours	2,107	3,880
Amount of Fund at 31 December 1983		$11,660

Field Naturalists Club of Victoria
Statement by the Members of the Executive Council

In the opinion of the members of the Executive Council of the FIELD NATURALISTS CLUB OF VICTORIA, the accompanying Balance Sheet is drawn up so as to give a true and fair view of the state of affairs of the Club as at 31 December 1983, and the accompanying Statement of Income and Expenditure is drawn up so as to give a true and fair view of the financial results of the Club for the year ended 31 December 1983. There are reasonable grounds to believe that the Club will be able to pay its debts as and when they fall due.
Signed in accordance with a resolution of the Executive Council on 29th March 1984.

Wendy Clark President
David Dunn Treasurer

Auditors' Report to the Members of
Field Naturalists Club of Victoria

In our opinion—

(a) The attached accounts, being the Balance Sheet, Statement of Income and Expenditure and Notes to Accounts, which have been prepared under the historical cost convention as stated in Note 4, together with the Statement by Members of the Executive Council, are properly drawn up in accordance with the provisions of the Companies (Victoria) Code 1981, and so as to give a true and fair view of:—
  (i) the state of affairs of the company at 31 December 1983 and the results of the company for the year ended on that date;
  and
  (ii) the other matters required by Section 269 of that Code to be dealt with in the accounts.

(b) The accounting records and other records and registers required by that Code to be kept by the company have been properly kept in accordance with the provisions of that Code.

DANBY BLAND PROVAN & CO.
Chartered Accountants
R. M. Bland
Partner

Melbourne
30th March 1984

FIELD NATURALISTS CLUB OF VICTORIA
GENERAL ACCOUNT
STATEMENT OF INCOME & EXPENDITURE FOR YEAR ENDED 31 DECEMBER, 1983

INCOME

1982			
	Subscriptions Received —		
$184	Arrears	$216	
13,930	Current	12,031	
384	Supporting	585	
$14,498			$12,832
$842	Sales of "Victorian Naturalist"		$186
	Interest Received —		
$13	Library Fund	15	
80	Bank Account	67	
1,654	Commonwealth Bonds	1,475	
860	Bonds — M. Wright Legacy	767	
165	Bonds — C. M. Walker Legacy	147	
1,071	National Mutual Deposit	1,040	
67	Life Membership Fund	70	
205	Natural History Medallion Fund	208	
$4,115			$3,789
$7	Profit — Tee Shirt Sales		—
	Sundry Income		4
1,121	Profit on Book Sales		233
$1,128			

EXPENDITURE

1982			
	Victorian Naturalist —		
$12,187	Printing	$12,781	
1,029	Illustrating	767	
1,775	Despatching	1,961	
120	Editorial	19	
$15,111		$15,528	
—	**Less** — Grants		
	Ingram Trust	—	
	Treasury (Note 3)	$3,200	3,200
$15,111			$12,328
$337	Working Expenses —		
	Postage & Telephone	402	
355	Printing & Stationery	372	
1,063	Bookkeeping & Typing	1,041	
750	Rent — Herbarium & Museum	790	
20	Rent for storage		
262	Affiliation Fees, Subscriptions & Donations	254	
150	Auditors' Remuneration (Note 1)	165	
186	Insurance	161	
219	General Expenses	298	
393	Natural History Medallion Expenses	340	
165	Kinglake Expenses — Rates	180	
$3,900			$4,003

		$311	Mammal Survey Group Trailer	—
		4	Subject Index — Loss	443
			Club Improvement Account —	
		1,121	Transfer of Profit on Book Sales	233
		136	Surplus for year	37
$20,583	$17,044	$20,583		$17,044

1. Auditors' Remuneration of $165 relates to auditing services only. No other benefits were received by the Auditors in respect of their services to the Club.
2. No Emoluments were paid by the Club to any member of the Executive Council.
3. State Treasury Grants for 1981/82, 1982/83 and 1983/84 have been received, but grants totalling $2,600 had not yet been applied against expenditure at 31/12/1983.
4. Basis of Accounting. The accounts have been prepared under the historical cost convention and have not been adjusted to take into account the current cost of specific assets.

FIELD NATURALISTS CLUB OF VICTORIA
BALANCE SHEET AT 31 DECEMBER, 1983

LIABILITIES

1982				
	Current Liabilities			
$2,391	Subscriptions paid in advance	$3,564		
2,558	Sundry Creditors	3,367		
62	M. A. Ingram Trust Grant in hand	154		
5,500	Treasury Grants in hand (Note 3)	2,600		
$10,511			$9,685	
	Special Funds & Accounts			
$7,500	Building Fund	$8,504		
42,999	Publication Fund	49,179		
7,780	Excursion Fund	11,660		
6,000	Marie Allender Excursion Fund	6,000		
100	Library Fund	100		
7,83-	Club Improvement Account	7,789		
5,217	Estate M. Wright Legacy	5,217		
1,466	Estate C. M. Walker Legacy	1,466		
20	Estate R. S. Chisholm	20		
200	Estate I. F. Knox Legacy	200		
200	Estate Ivy Dixon	200		
204	Estate I. Hanks	204		
597	Wilfred C. Woollard Fund	820		
673	D. E. McInnes Fund	881		
352	V. H. & B. E. Miller Fund	384		
90	N. A. Wakefield Memorial Fund	90		
300	P. F. Morris Gift Account	300		
250	Cedric Ralph Gift Account	250		
—	P. Matches Memorial Fund	500		
54	Kinglake Project Fund	356		
1,934	Natural History Medallion Fund	2,014		
520	Life Membership Fund	520		
311	Miscroscope Project Account	—		
$84,597			$96,654	

ASSETS

1982				
	Current Assets			
$3,760	Cash at Bank	$4,053		
10,000	Australian Savings Bonds at cost	10,000		
-	Sundry Debtors	1,541		
	Stocks on Hand at cost —			
3	Badges & Sundries	201		
123	Microscope Project			
1,204	Books for Sale	298		
	Tee Shirts			
1,568	Victorian Naturalist Subject Index	1,015		
$16,666			17,108	
	Fixed Assets at cost			
$8,990	Library Furniture & Equipment	$9,388		
	Land —			
141	Cosstick Reserve, Maryborough	141		
	Harold C. Frahm, Kinglake			
$9,131			$9,529	
	Investment of Funds at cost			
$8,300	Australian Savings Bonds	$8,300		
7,500	Esanda Ltd. Debentures	7,500		
	National Mutual Permanent			
7,882	Building Society — Deposit	6,999		
132	Statewide Building Society — Deposit	353		
$23,514			$23,152	

	Surplus Account				**Building Fund**		
$11,797	Balance at 1/1/1983	$12,482		$2,700	Australian Savings Bonds at cost	$3,100	
549	Transfer from Club Improvement Fund	274		4,400	Esanda Ltd. Debentures at cost	5,000	
136	Surplus for year	37		—	Sundry Debtors	28	
				400	Cash at Bank	376	
$12,482			$12,793	$7,500			$8,504
					Publications Fund		
				$42,780	Australian Savings Bonds at cost	$45,380	
				216	Book Stocks at cost	9,068	
				—	Sundry Debtors	600	
				3	Cash at Bank	2,910	
				—	Less Sundry Creditors	(8,779)	
				$42,999			$49,179
					Excursion Fund		
				$1,000	Australian Savings Bonds at cost	1,000	
				6,252	National Mutual Permanent Building Society — Deposit	6,990	
				9,558	Cash at Bank	4,236	
				(9,030)	Less Sundry Creditors	(566)	
				$7,780			$11,660
$107,590			$119,132	$107,590			$119,132

FIELD NATURALISTS CLUB OF VICTORIA

Reports of recent activities

General Meeting
Monday, 13th February

Silence was observed on the passing of Alf Baker who died suddenly on 28th January, in his 80th year.

Dan McInnes spoke of his first recollection of Alf, in 1955 when he (Alf) was President of the Club. It was at a general meeting at which a rowdy debate was ensuing over payment for the publication of the 'fern book' — an issue over which Alf threatened to resign!

Alf joined the club in 1938 and with an almost fanatical interest in rocks and minerals it was inevitably not long (early 1940's) before he had set up a separate geology group. For many years he **was** the geology group — on excursions he would look for specimens until it was too dark to see! He was made an honorary member in 1978.

Congratulations goes to two Club members who were made members of the Order of Australia in the recent Australia Day Honours list; Cliff Beauglehole for services to botany, conservation and ornithology, and Edward Heffernan for services to the visual arts.

Speaker for the evening was Dr Beth Gott from Monash University who spoke on the use of plants by Victorian Aborigines.

Dr Gott pointed out that as Victorian Aborigines ceased to live in a tribal way over 100 years ago it was necessary to go to historical sources (e.g. the writings of Mueller) for information. However, in early literature mention was often made only of the common name and unless the plant description clearly shows which plant the author was talking about, there is little to be gained. On the other hand some species obviously were of interest to the Aborigines as they still retain the Aboriginal name given to them, e.g. Cumbungi *(Typha),* Ballart *(Exocarpos)* and Murnong (Daisy Yam).

The Victorian Aborigines accumulated a quite remarkable knowledge of the natural world over a period of 40,000 years and Dr Gott's list of about 750 species (170 genera) of plants known or strongly thought to have been utilised is, by her own admission, in all likelihood but a fraction of the number that they had uses for.

With respect to providing food, of prime importance were plants with starch-containing tuberous or bulbous storage roots. There is a large number of species which fall into this category but probably the most well-known is the Daisy Yam or Murnong *(Microseris scapigera),* which evidently once occurred in its millions in Victoria. It was used frequently by Aborigines who would prepare it by steaming the tuberous root in an earth oven after which it would become quite sweet.

Certain types of root needed to be pounded to get access to their starch either because of a hard covering e.g. River Club Rush *(Scirpus fluviatilis)* or because of their high fibre content e.g. *Clematis microphylla.*

Root plants which produce smaller tubers or corms (but often in quite large numbers) include Ribbon weed, *Triglochin prosera* (numerous in the Barmah forest) and also some members of the Liliaceae e.g. Early Nancy, *Anguillaria dioica* and Vanilla Lily, *Arthropodium milliflorum.* Orchids also produce tubers and these would have been important as a food source, especially after fire when they can be very abundant. A root of a different sort that was eaten was the sclerote (underground mass) of the fungus *Polyporous mylittae,* "Blackfellows bread", which is said to taste rather like peaches when it is fresh.

Many plants would have had a number of uses. For instance the rhizome of Cumbungi not only provided the

(Continued next page)

(Continued from inside front cover)

GROUP MEETINGS

FNCV members are invited to attend any Group Meeting

Day Group — Third Thursday

Thursday, 19th April. Studley Park (if sufficient people interested). Leader: E. Gillespie 578 1879.

Thursday, 17th May. Fitzroy Gardens and MEB. Leader: A. Pittard 836 7725.

Thursday, 21st June, Oakleigh Technical School, Horticultural School. Leader: I. Gillespie 578 1879.

At the National Herbarium, Birdwood Avenue, South Yarra at 8.00 p.m.

Botany Group — Second Thursday.

Thursday, 10th May. National Parks of south Queensland — Betty Tyrell.

Thursday, 14th June. Member's night.

Geology Group — First Wednesday.

Wednesday, 2nd May. "Fossil Fish" — Miss Pam Gawth.

Wednesday, 6th June. "A discussion on the Australian mineral and mining industry — a rethink and its direction".

Mammal Survey Group — First Tuesday

Tuesday, 1st May. Leadbeater's Possum — David Lindenmayer.

Tuesday, 5th June. Bandicoots and Heathlands — Bert Lobert.

Microscopy Group — Third Wednesday.

Wednesday, 18th April. Aspects of Cytology — Dr. E. Peters.

Wednesday, 16th May. Mounting of Sea Urchin Spines — Mr H. Bishop.

Wednesday, 20th June. Rock Section — Mr D McInnes.

Aborigines with a rich source of starch but the fibre in the underground stem could also be used to produce string-up to 300 foot long — for catching prey such as ducks and emus.

Another category of foodplant which was utilised is those which produce seeds and/or fruits. However, due to their limited season (as opposed to the year-round availability of roots) these were not as important.

The seeds of Coast Wattle were used when still green, and the Aborigines would lay the pods on the fire to improve their taste. These seeds contain much starch and protein. Other fruit-bearing plants utilised were *Carpobrotus rosei* (whose leaves, incidentally, were also eaten like a green), *Exocarpos* (several species), *Coprosma quadrifida* (Prickly currant bush), *Kunzea pomifera* (cherry-sized fruits with an apple-like consistency), and the native raspberry *Rubus parvifolius.*

As indicated earlier plant fibre was important for the production of string, baskets, etc. Other plants known to be sources for this purpose include members of the genus *Acacia* and *Eucalyptus* (in both cases the bark was used), and also the Spreading flax lily *Dianella revoluta.*

In finishing her talk Dr Gott explained that the Victorian Aborigines actively managed the landscape. For example they would burn small patches of vegetation at times that they considered appropriate (not necessarily regularly), thus establishing a mosaic of regeneration. Their root-gathering activities ensured that the soil was kept loose and also that plants were periodically thinned out, thus promoting more vigorous growth.

We would do well to remember that early accounts described the Aborigines as a healthy, fine-bodied race of people.

Exhibits:

Dr Gott had on exhibit specimens of various plant species named in her talk and also a board displaying photographs and written information pertaining to the topic of the evening's talk.

Displayed under the microscope were:

(alive in a petri dish) a hydroid *Tubularia ralphii* from Beaumaris which was collected off 'mussel ropes' last December.

a slide showing a section of sea urchin spines (high power)

— pond life from Caulfield racecourse lake

pond life from Rosebud including shrimps and water fleas.

Two species of Scarab beetle were shown — one, *Phyllotocidium* from bark sheds near the Tambo river and the other a purple form of *Repsimus manicutus montanus.* According to text books this latter species is recorded as being green in colour.

Another member brought in several botanical specimens:

Hook sedge from Mount Howitt

— a fungus taken off a Myrtle beech tree, and several berry-producing plants from the Dandenongs, namely Banyalla, Elderberry, Panax and Prickly currant bush.

Field Naturalists Club of Victoria

Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron:
His Excellency Rear Admiral SIR BRIAN S. MURRAY, KCMG, AO.

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MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1984.

Metropolitan Members (03 area code)	$18.00
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The Victorian Naturalist

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GENERAL MEETINGS

Monday, 9th July, 8.00 p.m.

Mr Peter Gell. Birds of Mallee remnants.

Honorary membership will be awarded to Mr Percy S. Wyatt.

Monday, 13th August, 8.00 p.m.

Speaker to be confirmed.

New Members — May/June General Meetings

Metropolitan

Gwen Beattie, 24 Clonmore St., Beaumaris
Kenneth Bretherton, 32 Morrah St., Parkville
Elvie Chidzey, 61 Abbott St., Sandringham
Gwen Chidzey, 51 James St., Northcote
S. Howard, 94 McPherson St., North Carlton.
R. MacPherson, 8 Jean St., Lwr. Templestowe.
Hugo Phillipps, 11 Marlton Cres., St. Kilda
Jane Westman, P.O. Box 186, Ivanhoe
N. Scarlett, 7 Leyden St., Brunswick East

Joint

Don & Lorna Lawrence, 6 Mannering Dr., Glen Waverley
Wayne Young & Vicki Spencer, 8 Harrison Cres., Hawthorn
Denis & Jill Young, 63 Sandringham Rd., Sandringham.

Country

P. Kadwell, Lot 16 Cape Schanck Rd., Cape Schanck via Rosebud

Student

Gary Vines, 43 Welwyn Pde., Deer Park.
David Yeates, Dept. of Entomology, Uni. of Qld., St. Lucia

FNCV EXCURSIONS

Friday evening, 29th June-Sunday, 1st July. Dunolly area. Camp out with John Milligan and Dr Jim Willis. Walks Saturday and Sunday. Details from John Milligan, phone A.H. 557 3509.

Sunday, 1st July. Cheltenham Park. This is usually a good place for birds and there should be some early flowers. Meet at Cheltenham Station at 11.20 a.m., train leaves City at 10.45 a.m. Bring a picnic lunch.

Sunday, 5th August. Kinglake. Part of the day will be spent with the Geology Group who have an excursion to a bush area where fossil trilobites are found. The coach will leave Batman Avenue at 9.30 a.m. Fare $9.00, bring a picnic lunch.

Sunday, 2nd September. Coolart. The coach will leave Batman Avenue at 9.30 a.m. Fare $9.00. Bring a picnic lunch and binoculars if you have them. A lot of work has been done to the property since our last visit and there is a new entrance off Lord Somers Road as you approach Somers.

Saturday, 15th-Friday, 28th September. New South Wales, visiting the Warrumbungles and Kaputar National Parks and the Blue Mountains. Proposed itinerary is: Deniliquin, West Wyalong, Gilgandra (3 nights), Narrabri (2 nights), Tamworth, Singleton, Katoomba (2 nights), Canberra, Albury, Melbourne. The cost of this 14 day excursion based on 25 participants on current prices is $655.00. This covers coach travel and D.B.B. accommodation. Please book as soon as possible and send $50.00 deposit to M. Allender, Excursion Secretary.

Saturday-Sunday, 6th-7th October. V.F.N.C.A. Spring weekend. This year Ringwood F.N.C. are the host club and their proposed programme is an orchid exursion on Saturday afternoon to be led by Mr Bouchier which will leave from the North Ringwood Uniting Church hall, Dickson Crescent, at 1.00 p.m. Members wishing to do so may meet at 12 noon there for a picnic lunch. After the excursion the party will return to the hall for the evening meal, coffee and tea will be available, B.Y.O. food. Take-away food is obtainable at nearby shops. At 7.30 p.m. there will be a meeting and social get together in the hall, this will finish early as the hall has to be set up for Sunday. The Sunday excursion will be to Jumping Creek Reserve, meeting there at 10.00 a.m. In the afternoon there will be a walk from Antonio Park to Yarran Dheran. As Ringwood is so close to Melbourne we hope there will be enough cars to cater for members using public transport to Ringwood Station on Saturday. On Sunday there will be a coach from Melbourne leaving Batman Avenue at 9.00 a.m. Fare $8.00. Members who would like motel accommodation for the night should let Marie Allender know as soon as possible, they could be picked up by the coach on Sunday. Those wishing to camp should make their own arrangements, Crystal Brook Caravan Park is not far away, phone (03) 84 4367.

Friday 18th-Friday 25th January, 1985. Cann River.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Saturday, 30th June. "Fungi" led by Bruce Fuhrer.
Saturday, 28th July. Botanical Gardens Cranbourne.
Saturday, 25th August. French Island.

Mammal Survey Group

June 9th-11th (Queens Birthday weekend). Whale watching weekend at Warrnambool.
July 14th-15th. Braeside Metropolitan Park survey.
August 11th-12th. Dolly Creek.

(Continued on inside back cover)

The Victorian Naturalist

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May/June, 1984
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Editorial Committee: P. Lawson, D. McClellan, J. Phillips, R. Thomson, L. Williams.

Cover Illustration: The endangered Trout Cod. *Maccullochella macquariensis.* (Photo: G. Schmida). See article on page 112.

The Conservation Status of the Native Freshwater Fish of Victoria

BY P. L. CADWALLADER,[1] G. N. BACKHOUSE,[2] J. P. BEUMER[3,4] AND P. D. JACKSON[3]

As part of an Australia-wide review of the conservation status of native freshwater fish by the Australian Society for Fish Biology, the Victorian branch of the Society held a meeting in November 1982 to discuss the status of the native freshwater fish of Victoria and to assign each species to one of several categories based on relative abundance and distribution, taking into account historical aspects of biogeography. The broad background of the participants at the meeting, ranging from professional fisheries biologists to amateur naturalists, ensured that a large volume of information from diverse sources was considered before assigning a species to a particular category. The categories adopted were based on the International Union for the Conservation of Nature (I.U.C.N.) Red Data Book definitions (Holloway, 1979) as modified by Ahern (1982):

Category A — Endangered in Victoria.

Taxa in danger of extinction and whose survival is unlikely if the causal factors causing the demise continue operating. Includes taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that the species are deemed to be in immediate danger of extinction.

[1] Snobs Creek Freshwater Fisheries Research Station and Hatchery, Private Bag 20, Alexandra, Victoria 3714.

[2] Field Management Branch, Fisheries and Wildlife Division, 250 Victoria Parade, East Melbourne, Victoria 3002.

[3] Arthur Rylah Institute for Environmental Research, 123 Brown Street, Heidelberg, Victoria 3084.

[4] Present address: Fisheries Management Branch, Department of Primary Industry, G.P.O. Box 46, Brisbane, Queensland 4001.

Category B — Vulnerable in Victoria

Taxa believed likely to move into the endangered category in the near future if the casual factory causing the demise continue operating. Includes taxa of which most or all of the populations are decreasing as a result of over-exploitation, extensive habitat alteration or other environmental disturbance; taxa with populations seriously depleted and whose ultimate security is not yet assured; and taxa with populations which are still thriving but are under threat from adverse factors throughout their range.

Category C — Restricted distribution, or rare, or both in Victoria

Taxa not at present considered to be endangered or vulnerable, but whose populations are localised within restricted geographical areas or habitats, or whose populations are thinly scattered over a more extensive range, and are at risk.

Category D — Indeterminate, possibly threatened in Victoria

Taxa for which current information is insufficient to establish status more accurately, but which appear to be restricted or rare or both, and hence warrant further investigation.

Category E — Requiring careful monitoring in Victoria

Taxa highly, or wholly, dependent on Victorian environments for overall survival and which are not presently threatened, but could become so in the near future if suitable management guidelines are not devised.

Category F — Presumed extinct in Victoria

Taxa presumed already extinct in Victoria.

TABLE 1. Conservation Status of the Native Freshwater Fish of Victoria. Information on the distribution, relative abundance and life history of each species is summarised in Cadwallader and Backhouse (1983).

Cat.	Specific Name	Common Name
A	*Maccullochella macquariensis*	trout cod (Fig. 1.)
B	*Protoctes maraena*	Australian grayling
	Macquaria ambigua	golden perch
	Macquaria australasica	Macquarie perch
	Maccullochella peeli	Murray cod
	Bidyanus bidyanus	silver perch
C	*Potamalosa richmondia*	freshwater herring
	Galaxias brevipinnis	broad-finned galaxias
	Galaxias fuscus[1]	"mountain galaxias"
	Galaxias truttaceus	spotted galaxias
	Galaxias cleaveri	Tasmanian mudfish
	Craterocephalus stercusmuscarum	freshwater hardyhead
	Craterocephalus eyresii	Lake Eyre hardyhead
	Ambassis catelnaui	western chanda perch
	Macquaria novemaculeata	Australian bass
	Edelia obscura	Yarra pigmy perch
	Mogurnda adspersa	southern purple-spotted gudgeon
	Gobiomorphus australis	striped gudgeon
	Gobiomorphus coxii	Cox's gudgeon
D	*Geotria australis*	pouched lamprey
	Nematalosa erebi	bony bream
	Galaxias rostratus	flat-headed galaxias
	Tandanus tandanus	freshwater catfish
E	*Galaxiella pusilla*[2]	dwarf galaxias
	Gadopsis marmoratus (northern)[3]	river blackfish
	Gadopsis marmoratus (southern)[3]	river blackfish
F	No species are known to have become extinct in historical times	
G	*Mordacia mordax*	short-headed lamprey
	Anguilla australis	short-finned eel
	Anguilla reinhardtii	long-finned eel
	Galaxias maculatus	common galaxias
	Galaxias olidus	mountain galaxias
	Retropinna semoni	Australian smelt
	Melanotaenia splendida	crimson-spotted rainbowfish
	Atherinosoma microstoma	small-mouthed hardyhead
	Macquaria colonorum	estuary perch
	Nannoperca australis	southern pigmy perch
	Pseudaphritis urvilli	tupong
	Philypnodon grandiceps	flat-headed gudgeon
	Philypnodon sp.	dwarf flat-headed gudgeon
	Hypseleotris klunzingeri[4]	western carp gudgeon
	Pseudogobius olorum	blue-spot goby
	Arenigobius bifrenatus	bridled goby
	Favonigobius tamarensis	Tamar River goby

[1] *Galaxias fuscus* is presently considered to be a junior synonym of *G. olidus;* see McDowall and Frankenberg (1981).

[2] *Galaxiella pusilla* would be placed in category B if unmodified I.U.C.N. categories were used.

[3] *Gadopsis marmoratus* may have distinct "northern" and "southern" forms separated by the Great Dividing Range; this species would be placed in category D if unmodified I.U.C.N. categories were used.

[4] *Hypseleotris klunzingeri* is now considered to be a complex of two or more species (Hoese *et al.*, 1980), but all are considered common.

Category G — Common and secure in Victoria (not one of Ahern's categories, but included here for the sake of completion)

Taxa which are common or abundant in Victoria, or widespread and are, at least in some habitats, secure and face no immediate threat to their survival.

The status of each species, on the basis of the above categories, is indicated in Table 1. Allocation to a particular category was determined after consideration of species characteristics (eg. breeding biology, food and feeding behaviour, migrations, interactions with exotic species) and trends in distribution and abundance. However, it became obvious during the course of the project that there was a lack of information on many species, not only in relation to trends in distribution and abundance but also with regard to basic species characteristics.

The status of the river blackfish *Gadopsis marmoratus* was the subject of much discussion. Although the nominal species is quite common in Victoria, it is uncommon in both New South Wales and South Australia. Therefore, the mainland form is considered to be highly dependent on the Victorian environment for its survival. In addition, the taxonomy of the river blackfish (family Gadopsidae) is currently under review and it appears that there may be at least two species in Victoria. Until the taxonomy is resolved, the distribution and status of the various species cannot be determined. In view of this, *G. marmoratus* was placed in category E or, if unmodified I.U.C.N. categories are used, category D. However, it should be noted that the list is a dynamic one and that the status of a particular species can be reviewed at any time. The entire list is to be revised every five years, but changes may be made in the interim if specific needs arise.

It is intended that this up-to-date review of the conservation status of each of the native freshwater fish of Victoria will assist in the determination of conservation priorities at the State level. It is also the feeling of the authors that just as refuges, sanctuaries and reserves are set aside for the protection of native birds and mammals some similar form of protection should be afforded native fish species and their habitat.

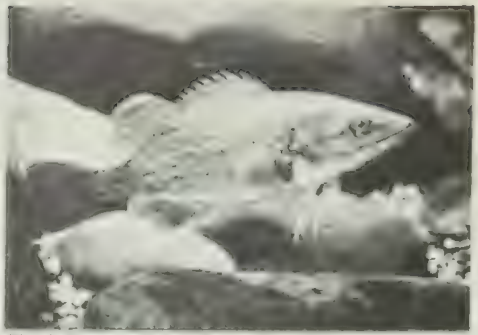

Fig. 1. The trout cod, *Maccullochella macquariensis*, the only native freshwater fish considered to be endangered in Victoria at present.
Photograph: G. Schmida.

Acknowledgments

In addition to the authors, the following people also contributed to the compilation of the conservation status list: A. M. Brown, A. R. Fletcher, D. J. Hume, A. K. Morison (Fisheries and Wildlife Division, Department of Conservation, Forests and Land); H. Daly (Chisholm Institute of Technology); M. Gomon (Museum of Victoria); P. S. Lake (Monash University); R. Lewis (Native Fish Australia); R. Lee, G. Thompson, R. Turner (Australia New Guinea Fishes Association); R. Kuiter, S. L. Malcolm and J. Tyley.

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A Survey of *Hydromys chrysogaster*, the Australian Water Rat in Central Gippsland.

BY LESLEY R. SMALES*

Introduction

Hydromys chrysogaster, the water rat is reported as widespread and common throughout Australia, inhabiting most inland water systems, estuaries, marine beaches and offshore islands. It is highly adapted to aquatic life and is easily distinguished from all other native rodent species by the webbing between the toes of its hind feet. Other distinctive features include its thick white-tipped tail, long blunt muzzle, flattened head and small eyes and ears (see Fig. 1). It is usually found close to water but may range over considerable distances in search of food (McNally, 1960). The diet includes fish, large aquatic insects, crustaceans, small birds and mussels (Woollard *et al.*, 1978).

From surveys carried out by the Fisheries and Wildlife Division (Norris *et al.*, 1979; Norris and Mansergh, 1981; Mansergh and Norris, 1982; Norris *et al.*, 1983) it was found that water rats were not generally common in the Gippsland region. Although often present in lowland rivers and occasionally found upstream in the ranges, water rats were neither as common nor as damaging as in northern Victoria (McNally, 1960).

In this study the result of trapping, during 1983, along the Latrobe River and its tributaries, are presented. Although a mammal survey was not the primary aim of the study as water rats were required for parasitological purposes these results provide new records of water rat distribution in Central Gippsland. Overall however, the findings, of previous surveys, that water rats have a scattered distribution and are uncommon in South, Central and the Lakes Catchment Regions of Gippsland were confirmed.

*Gippsland Institute of Advanced Education, Churchill, Victoria 3842.

Methods

Trapping took place during the period December, 1982-December, 1983. Wire mesh cage traps (10 supplied by courtesy of the Fisheries and Wildlife Division, 4 supplied courtesy of the Veterinary Clinical Centre, Werribee) baited with fish or sardines were used. Trapping localities are shown in Fig. 2. Some were selected because of reports that water rats had been seen in the area, others because the habitat seemed suitable. Trapping sites are listed in Table 1. Traps, sited so as to minimise interference from local fishermen and campers, were left 2-3 days, being checked daily.

Results

Results are given in Table 1. A total of 37 bush rats *Rattus fuscipes*, one black rat *Rattus rattus*, one platypus *Ornithorhynchus anatinus*, one feral cat *Felis catus*, and five water rats *Hydromys chrysogaster* were captured. Of the water rats, three were from the Latrobe River near the junction with the Morwell River and the outfall from the Blue Lagoon (sites 11 and 12), while two were from the Macalister River near Cheynes Bridge (site 9). The specimens from the Latrobe River had a creamy-white underbelly, while those from the Macalister River were the rich, golden-yellow colour variant. Of the other trapping sites selected, water rats had been seen some years earlier at the Middle Creek, Yinnar South (site 1), but there was now no sign of feeding tables, burrows or tracks. Since the water flow had been lowered almost to a trickle because of the drought, any water rats previously inhabiting the area may have moved to more suitable locations. A water rat had been reported swimming down stream from the Willow Grove site (site 14)

Fig. 1. The water rat (*Hydromys chrysogaster*) is an uncommon mammal of Central Gippsland.

during October, but no signs of water rat presence were found along the Tanjil River. Feeding tables at the McLennan Straits site (site 3), were the only other signs of water rats seen during the survey.

At Mt. Elizabeth Road Crossing (site 16) the campsite was raided on two evenings, suggesting the presence of water rats in the area (Watts and Aslin, 1981). No water rats were caught at the Boolarra Fish Farm (site 2), although water rats had been reported there some months previously. Flooding along the Thomson River during April inundated the trapping sites and while the traps were under water a platypus was caught and drowned at Reilly's Bridge (site 7). All the bush rats caught were released at the place of capture.

Discussion

The results of this survey confirm the findings of the Fisheries and Wildlife Division that water rats are not commonly found in the Latrobe River and its tributaries. The two localities where water rats were trapped represent new records for the literature, although informal conversations had indicated the possible presence of the species in the Macalister River. There are two fish farms in the region, one at Boolarra and the other at Noojee. The proprietors of both farms were contacted during the survey period. Permission was granted to trap at Boolarra, there having been trouble with water rats some months previously, but not at Noojee, where they had not seen water rats for years. It seems likely that any water rats moving into either of these places would be quickly removed to protect fish stocks. During the mammal survey at Darlimurla in 1968 (Seebeck *et al.*, 1968) a water rat was collected and it was suggested that it might have been ranging from its home territory. With the establishment of the fish farm at Boolarra, it is likely that any

Table 1. Mammals trapped during a survey of *Hydromys chrysogaster*.

Locality	Trap Nights	*H. chrysogaster*	*R. fuscipes*	Other
1. Middle Creek	12	—	—	—
2. Boolarra Fish Farm	39	—	—	—
3. McLennan Straits	12	—	—	—
4. Hearr Landing	12	—	—	—
5. Sale Swing Bridge	8	—	1	—
6. Heyfield Bridge	15	—	4	*R. rattus*
7. Reilleys Bridge	17	—	4	*O. anatinus*
8. Cowwarr Weir	9	—	—	—
9. Cheynes Bridge	45	2	11	—
10. Glenfalloch	12	—	—	—
11. Toms Bridge	9	1	—	—
12. Blue Lagoon	39	2	9	*F. catus*
13. Tyers Road Bridge	24	—	3	—
14. Willow Grove	21	—	2	—
15. Fumina Bridge	18	—	3	—
16. Mt. Elizabeth Road Crossing	27	—	—	—

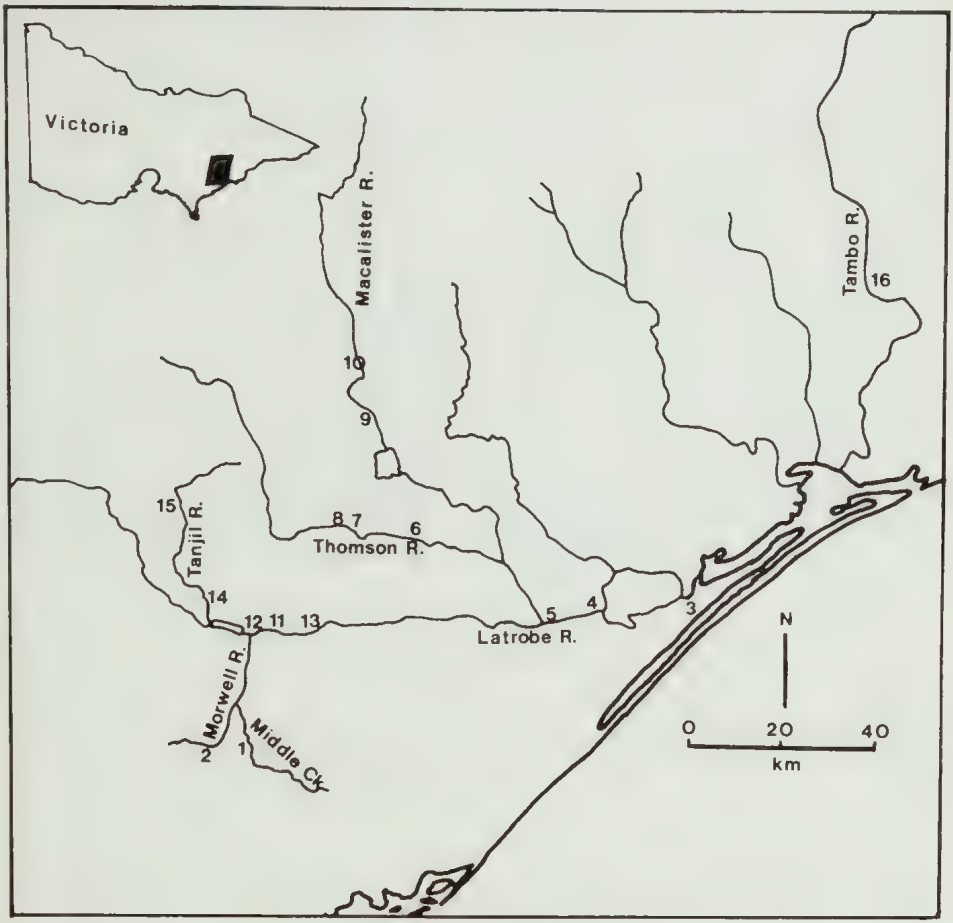

Fig. 2. Location of trapping sites.

water rats travelling throuh the area from the Morwell River would be regarded as pests and removed.

The water rat is usually reported as widespread and abundant. However, in inland waterways which have not been disturbed by man, it is likely that its distribution is scattered and that it may be relatively uncommon. Watts and Aslin (1981) suggested that the water rat may be one of the few native mammals to have profited from human activities in some areas. Certainly it is in areas where intensive irrigation projects have been developed, such as in the Murray-Goulburn district, or where fishermen's activities, including disposal of fish offal in the water, have become established, that water rats are known to be common and may be designated pests. In the Gippsland surveys, the water rat was found to be common only around fishing ports such as Paynesville (Norris *et al.*, 1983).

One of the options which the State Electricity Commission of Victoria proposes in its future planning for brown coal development, is the diversion of the Morwell River to the east of Morwell, to provide access to coal fields west of Yallourn. This would destroy the only location within Central Gippsland where water rats seem, at present, to be relatively abundant. Mansergh and Norris (1982) designated Tarra Valley as a site of regional significance partly on the basis of having recent records of *Hydromys chrysogaster*, "which is uncommon in this part of Gippsland". The importance of the Tarra Valley Block for the survival of water rats within the region will be even greater if the Morwell River diversion goes ahead.

Acknowledgements

This work was carried out under the provisions of Fisheries and Wildlife Permit No. 82-168. My thanks to Mr G. Warner, for assistance with field work and to Mr N. Smith of the S.E.C., for permission to trap within the Yallourn Power Station precints.

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Bush-peas of Victoria — *Genus Pultenaea*

By M. G. Corrick*

***Pultenaea luehmannii* J. H. Maiden in *Victorian Nat.* 22:100(1905), (Fig. 27).**

P. luehmannii is a lax, diffuse plant which trails among the thick vegetation of swamps or forms a loose mat on open ground.

The terete stems are finely pubescent when young but become glabrous and bronzy coloured with age.

The leaves are opposite and widely spaced along mature, flowering stems; they are 5-7 mm long and 1-3 mm wide with incurved margins. Young plants and those in exposed situations have more closely spaced leaves which are broader and shorter than usual. The upper leaf surface is pale green and glabrous, the lower surface is darker and covered with scattered, appressed hairs.

The orange and dark purple flowers are in terminal heads of 1-4 flowers in the axis of a pair of leaves. There are a few dark brown bracts at the base of the flower heads. The pedicel is about 1 mm long and elongates slightly in fruit.

The lanceolate bracteoles are about 2 mm long and attached at the base of the calyx which is 4-5 mm long with acuminate lobes. Both bracteoles and calyx are densely hairy with white appressed hairs.

The orange standard is 9 mm long and 8 mm wide with dark purple shading at its base; both wings and keel petals are tipped with dark purple.

The ovary is densely covered with fine white hairs. The pod is dark brown, rather flat and covered with scattered white hairs.

Flowering time is late October to early November.

P. luehmannii is endemic in the Victorian Grampians. It occurs in the Victoria Valley, including surrounding low hillsides and on the western side of the southern Victoria Range (Fig. 29). It is a distinctive plant; the opposite, widely spaced leaves and delicate trailing habit set it apart from other species in the genus.

SPECIMENS EXAMINED included: The Grampians; Victoria Gap, *A. C. Beauglehole 17355* (MEL 654930), 1.x.1978; Victoria Valley Rd., *M. G. Corrick 1955* (MEL 654999), 30.x.1969; Pipehead, Hamilton Waterworks, *H. B. Williamson* (MEL 579974 — Type), xi.1904.

***Pultenaea subalpina* (F. Muell.) Druce in *Bot. Soc. Exch. Club Brit. Isles* 1916:643(1917), (Fig. 28).**

P. subalpina is a rigid, spreading shrub usually about 1-1.5 m high. The stems are terete and the older ones are scarred with persistent leaf bases and broken stipules.

The alternate, upcurved leaves are 6-12 mm long and 1 mm wide, terete, channelled above and very scabrid.

The dark brown, lanceolate stipules are about 6 mm long, united at the base and each has a distinct mid-rib. They are set close to the stem and are easily broken.

The flowers are axillary and clustered at the tips of the branches in apparent heads; there are no bracts but the leaves within the inflorescence are usually reduced and have enlarged stipules.

The bracteoles are dark brown, lenceolate and attached at the base of the calyx.

The pedicel is 1-2 mm long and the calyx 5-6 mm long with slender, acuminate lobes. Calyx and bracteoles have soft, white hairs which vary in density; some specimens are thickly covered, in others the hairs are restricted to the calyx lobes and tips of the bracteoles.

The flowers are a rich, rosy pink; the standard is 9-11 mm long and 7-9 mm wide with a cream patch at the base.

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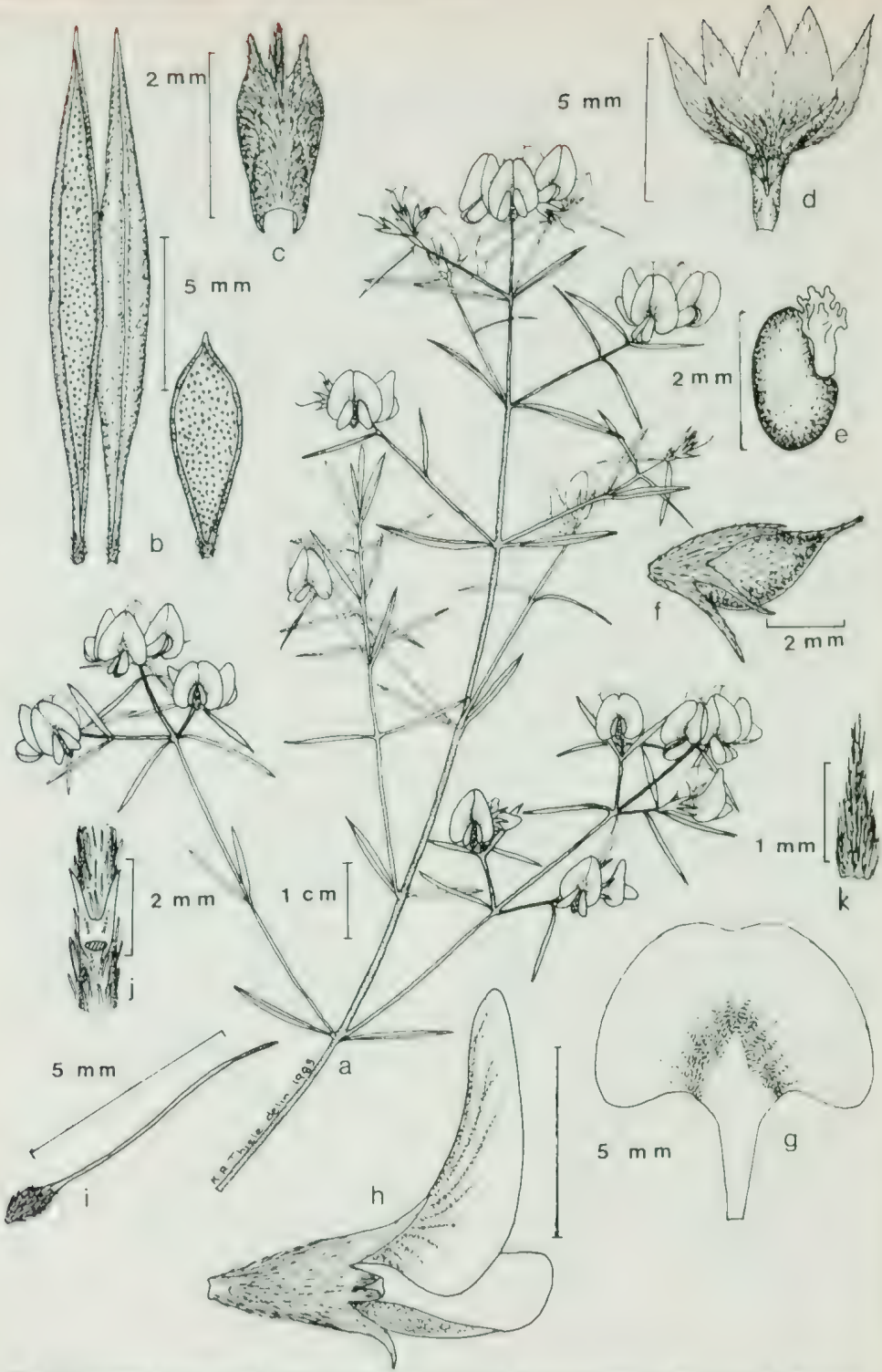

Fig. 27 *Pultenaea luehmannii*. a, habit x 1; b, leaves, c, bract; d, calyx with bract; e, seed; f, fruit, g, standard, front view, h, flower, side view, i, ovary and style, j, section of stem with stipules, leaf removed; k, bracteole, all from MEL 654999 except e and f from MEL 644335.

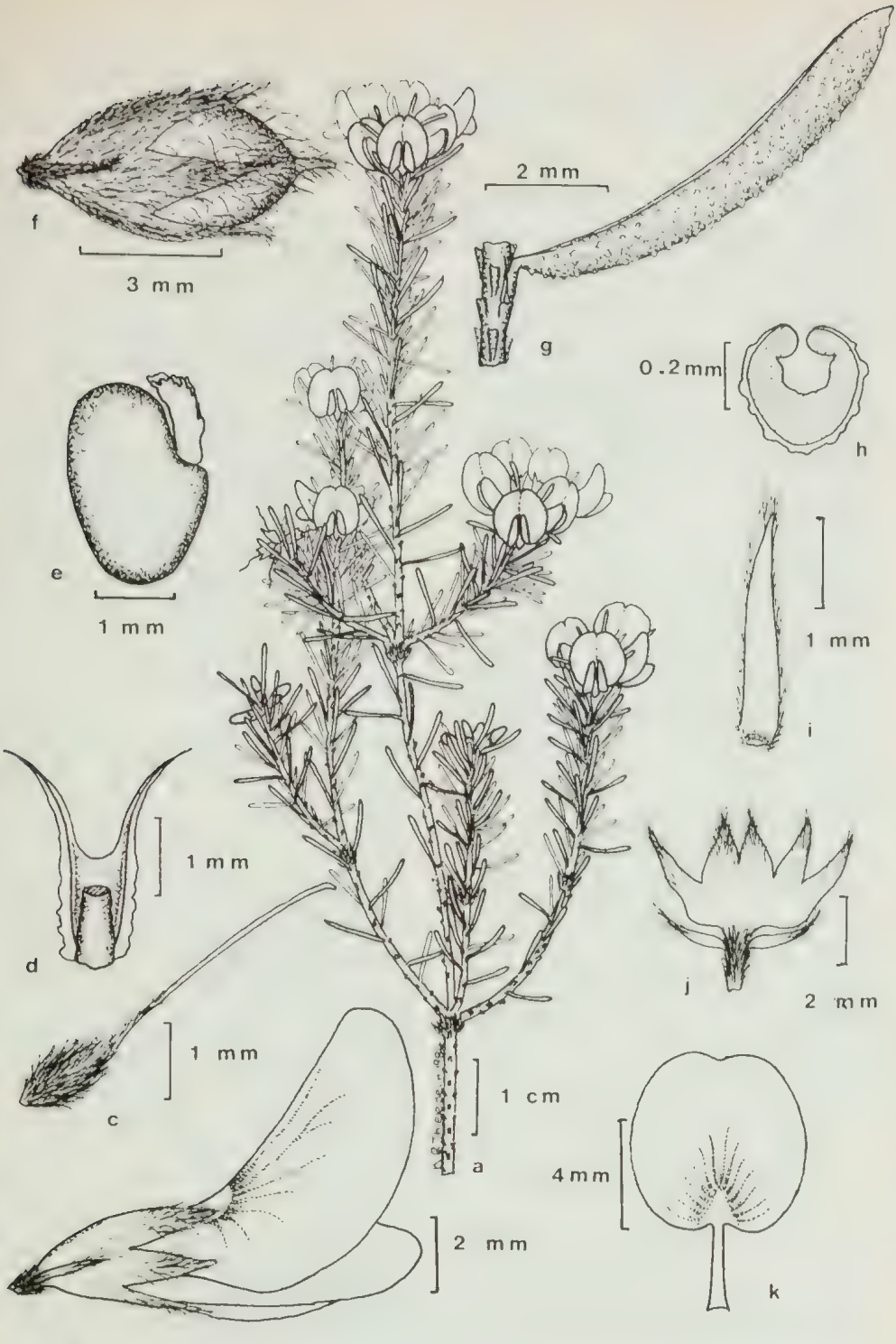

Fig. 28. *Pultenaea subalpina*. a, habit x 1; b, flower; c, ovary, d, stipules, leaf removed; e, seed; f, fruit, g, leaf; h, t.s. leaf; i, bracteole, adaxial face; j, calyx; k, standard; all from MEL 644344 except e and f from MEL 654169

The ovary and base of the style are densely covered with soft white hairs.

The pod is plump, hairy and half enclosed by the calyx.

Flowering time is November to early December.

This strikingly beautiful shrub is the only *Pultenaea* with pink flowers. It is endemic in the Grampians and occurs on the high parts of Mt. William and Mt. Rosea, the Major Mitchell Plateau and parts of the Serra Range between Mt. Rosea and Middletons Gap (Fig. 29). The populations in the latter area described by W. H. Nicholls (1927, p. 231-2) included one bush "found to be 11 feet 6 inches in height and 16 feet across . . . towards D'Alton Peaks we saw . . . (it) in such profusion that large patches were visible to the naked eye at a distance of over half a mile".

I have seen no subsequent collections from this area and the present state of the plants there is not known. In more accessible areas it is a moderate sized shrub; it seems likely that it needs a sheltered situation and protection from fires to reach maximum size.

SPECIMENS EXAMINED included: The Grampians: Mt. William, *R. Filson 15800* (MEL 654169), 17.ii.1977; Mt. William, *F. Mueller* (MEL 35355), 14.xi.1853; Between Mt. Rosea and D'Alton Peaks, *W. H. Nicholls* (MEL 654153), 7.xi.1927; Mt. Rosea, *F. Robbins* (MEL 561409), 1935; Major Mitchell Plateau, *J. H. Willis* (MEL 644344), 8.xii.1982.

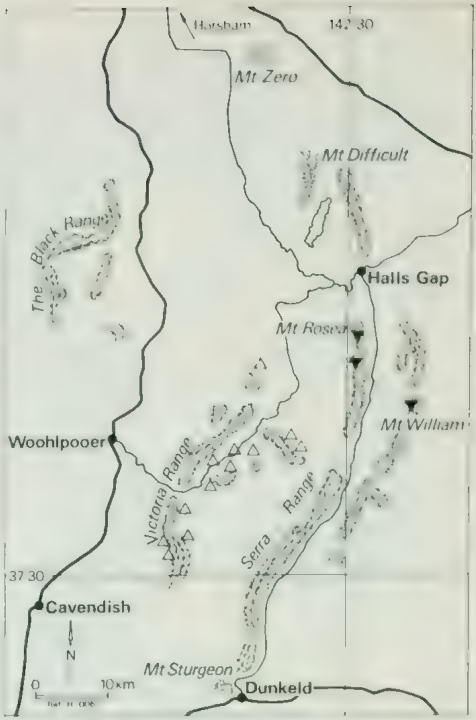

Fig. 29. The Grampians, showing known distribution of: △ *Pultenaea luehmannii*.

▼ *P. subalpina*.

Acknowledgement

I am most grateful to Kevin Thiele for the drawings accompanying this article.

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Yellow-tailed Black Cockatoo Survey

Volunteers are required from areas where these birds are regularly seen to keep a record of sightings. If you are interested further information and record sheets are available from Jill McLean, Yellow-tailed Black Cockatoo Survey, PO Box 236 Falls Creek, Vic. 3699.

Brush-tailed Rock-wallabies in the Grampians

By Roy Dunn*

Introduction

The Brush-tailed Rock-wallaby, *Petrogale penicillata,* was once abundant in north-eastern Gippsland and is known to have occured in parts of western Victoria (Wakefield, 1971), including the Grampians. However by about 1920 the species was believed to have become extinct in Victoria until the discovery of several small colonies in the vicinity of the Snowy River in about 1953. *P. penicillata* has declined throughout much of its range and its disappearance from many of its former haunts has been associated by some authors (Wakefield, 1961, 1971; Short, 1982; Maynes and Sharman, 1983) with predation by the introduced European Fox, *Vulpes vulpes*. The arrival of this predator in East Gippsland was followed by a decline in rock-wallaby populations (Wakefield, 1961) and a reduction in numbers of the Yellow-footed Rock-wallaby, *P. xanthopus* in the Gawler Ranges of South Australia coincided with the arrival of foxes in the area shortly after 1910 (Copley, 1983). No evidence was forthcoming to indicate the survival of the Brush-tailed Rock-wallaby in western Victoria until 1970 when a small colony was discovered in the Red Rock area of the western Grampians (Wakefield, 1971). Since that time interest in this colony appears to have waned and no information upon its status has been published for many years. No detailed study of the Grampians rock-wallabies has ever been conducted and the chromosome work which would reveal their relationship to other rock-wallabies has yet to be carried out (R. Close, pers. comm.).

In 1980 I first visited the Red Rock area in an attempt to determine whether or not rock-wallabies still occurred in the area. I have since explored much of the rocky terrain in the vicinity of Red Rock and despite having yet to see a Grampians rock-wallaby the presence of fresh faecal material convinced me that the species was still present in March 1984. Observations were limited to daylight, no spotlighting having been undertaken to date.

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Signs of Survival

In early 1980 Peter Brown and I spent some time in the Flinders Ranges of South Australia observing that most beautiful of macropods, the Yellow-footed Rock-wallaby, *P. xanthopus*. Directions from Dr. Tony Robinson of the National Parks and Wildlife Service enabled us to quickly locate rock-wallabies in easily accessible habitat where, rather to our surprise, they were abundant and easily visible, especially at dusk when they descended from the rocks to forage. However as we extended our explorations on subsequent days we found that populations were disjunct and scattered and that outcrops and cliffs inhabited by rock-wallabies could most easily be identified by the presence of the distinctive faecal pellets or scats of the animals. Upon our return to Victoria we resolved to apply our newly acquired experience in an attempt to locate rock-wallabies in the Grampians.

During 1980 I visited the Red Rock area on three separate occasions. Despite extensive exploration of the steep and often densely vegetated terrain I failed to locate the rock-wallaby site described by Wakefield on the first two visits, but did find a few rock-wallaby scats.

Rock-wallaby scats are often deposited in sheltered situations in caves or upon protected ledges. In such situations they may survive for long periods and

Wakefield (1971) has suggested that some faded faecal pellets may be several decades old. In order to get a rough idea of the rate of fading, some fresh scats were obtained from the captive rock-wallaby colony at Melbourne Zoo. These were placed in a sheltered position exposed to several hours of sunlight daily but protected from rain. The scats were dried out in a few days and two months later had begun to fade in colour. There are obviously many variables which would affect faecal material in the bush but I believe that rock-wallaby scats from exposed sites which show no sign of fading may generally be considered to be less than two months of age. In this paper such scats are described as "fresh".

On my third visit to Red Rock, accompanied by Peter Brown and Denise Deerson of the Fisheries & Wildlife Division, the rock-wallaby site was finally found. Many old and a few fresh scats were found in and around the small caves beneath the mass of fallen rock described by Wakefield as the home of the rock-wallabies, but the site (Site 1) did not appear to be used with regularity. What appeared to be a second home site (Site 2) was later discovered several kilometres to the south of the first, consisting of a labyrinth of caves and crevices beneath fallen rocks. Within its shelter some rock surfaces were highly polished by rock-wallaby use over long periods. Fresh scats were present.

In early 1981 a fire burnt much of the forest immediately adjacent to both sites, however fresh scats were present at both when they were visited about a month after the fire, although these may have predated it.

I next visited the Grampians in October 1982 when I spent three days at Red Rock. Both sites were examined and only scats in a desiccated, faded condition could be found, suggesting that wallabies had been absent for some time. The following day I ascended the bluff above Site 2 to investigate rocks not previously explored

Fig. 1. Rock-wallaby scats collected in the Grampians in October, 1982.

and was relieved to find a number of fresh faecal pellets scattered about on exposed rocks. These were collected and photographed (Fig 1). In September 1983 I examined Site 1 and could find no indication of its continued use by rock-wallabies. Fresh fox tracks were present. The onset of persistent heavy rain prevented investigation of Site 2.

In March 1984 I visited Site 2 accompanied by Dr Robert Close of Macquarie University. Dr Close, who is a member of the Australian Rock-wallaby Survey Team, had investigated numerous Grampians sites over the previous three weeks and some of these contained evidence, in the form of faecal pellets, skeletal material and polished rock surfaces, that they once supported rock-wallaby colonies. One of these old colony sites was within 1 km of Site 1 which was also inspected. However, no evidence had been found that rock-wallabies were still extant in the region.

Having examined Site 2, which contained no signs of recent occupation, we climbed to the rocky bluff above. Here, close to where I had collected fresh scats in October 1982 we found more, some apparently only a few days old. Faeces of various sizes were found, suggesting that several animals, including at least one juvenile, were present. Fox scats were collected close by and these were sent to the Keith Turnbull Research Institute for

examination. They proved to contain no identifiable rock-wallaby remains (H. Brunner, pers. comm.).

Discussion

The apparent desertion of Sites 1 and 2 by wallabies may have been in response to a reduction of available food caused by fire. Alternatively it could signify a further contraction of what may be the last surviving colony of a once extensive population.

A study of the habitat requirements of Brush-tailed Rock-wallabies in New South Wales indicated that the species now appears to be restricted to the most complex and inaccessible rocky sites. Habitat occupied by the species include cliff-faces containing numerous caves, sheltered ledges and steep, narrow cracks or chimneys. The presence of foxes was suggested as one factor which may have raised the threshold of suitability of rocky habitat so that fewer sites are now occupied (Short, 1982).

The fox is now securely established and widely distributed on the Australian mainland, where it has replaced the dingo as the dominant predator in many areas. An agile rock climber, it is small enough to enter the narrow caves and crevices within which rock-wallabies shelter. The fox preys upon a wide range of species but in many areas rabbits form the major part of the diet (Coman, 1973).

The results of a study of dingo predation upon kangaroos and emus (Caughley *et al.*, 1980) challenges the hypothesis that predators are unable to reduce prey species to very low densities because their own numbers decline reciprocally as food becomes scarce. Dingoes in the study, although preying upon kangaroos, had access to an abundant alternative prey in the form of rabbits, and were therefore able to reduce kangaroos to very low densitities without adverse effects upon their own numbers. It may be speculated that foxes are able to impose similar pressures upon rock-wallabies which exist in sympatry with rabbit populations.

Feral goats have been accused of depriving rock-wallabies of essential shelter by ousting them from caves (Copley, 1983) and park rangers have expressed to me their belief that goats played a significant part in the decline of Brush-tailed Rock-wallabies in the Warrumbungles National Park. Goats are encountered infrequently in the Grampians and it seems unlikely that here they have significantly affected rock wallaby numbers.

Regularly occurring phenomena such as drought and fire may force wallabies to forage away from the security of cliffs thus increasing their vulnerability to predation, and a changed fire regime since European settlement may have caused habitat changes which adversely affect rock wallabies. The grassy ground-cover which once covered much of the Grampians has been largely replaced by dense, shrubby undergrowth. Grasses are known to form a significant part of rock-wallaby diets (Wakefield, 1971; Copley and Robinson, 1983) and such changes seem likely to have been detrimental, although Short (1982) found that the percentage of grass ground cover did not affect the suitability of rocky habitat for rock-wallabies.

It seems probable that the rock-wallabies of the Grampians have declined to their present level because of a combination of factors including predation and habitat change. When Wakefield first recorded the existence of the Red Rock colony he estimated that it consisted of "only several animals". No further evidence has been produced to suggest that he had underestimated the size of the population, and it seems remarkable that the factors responsible for the progressive decline of the species in Victoria have failed, in a 14 year period, to eliminate this tiny relict colony.

The locations of several sites containing evidence of former occupation by rock-wallabies are known but these colonies

now appear to be extinct. Sightings of rock-wallabies are occasionally reported from various localities in the Grampians but these have yet to be positively substantiated (R. Close, pers. comm.). Much potential rock-wallaby habitat is extremely difficult of access and awaits investigation. It is quite possible that other living colonies exist, but to date the Red Rock colony is the only one for which conclusive evidence of survival is available.

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Little Penguin as a Prey Item of the Leopard Seal

BY M. SCHULZ* AND K. A. MENKHORST†

The Leopard Seal (*Hydrurga leptonyx*) is occasionally recorded along the coast of south-eastern Australia, mainly between the months of August and October (King, 1983). The individuals reported are mostly young animals that tend to move further northwards than breeding adults (Gaskin, 1972).

On the 24 December 1983 a young male Leopard Seal was observed lying on Stephens Beach, south of Port Davey, south-western Tasmania (43° 23′, 145° 58′). It appeared to be in an exhausted state reacting little to the approach of curious humans.

After a time the seal was observed to excrete a large formless faece. On examination this was found to be full of the feathers of the Little Penguin (*Eudyptula minor*). The Little Penguin is a common species off the south-west coast of Tasmania breeding on a number of islands, including Mutton Bird Island which is located offshore from Stephens Beach (refer to TASMAP 8011).

The Leopard Seal has earned a reputation for being an active predator of Antarctic penguin species (Gaskin, 1972) and it would appear that the locally breeding Little Penguin also forms a prey item of Leopard Seals that range into south-eastern Australian waters.

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Fig. 1. Leopard Seal on Stephens Beach, Tasmania.

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A Survey of the Aphodiinae, Hybosorinae and Scarabaeinae (Coleoptera: Scarabaeidae) from Small Wet Forests of Coastal New South Wales, Part 5: Littoral rainforests from Myall Lakes to Crowdy Bay National Park

BY G. A. WILLIAMS* AND T. WILLIAMS*

Abstract

Data are presented on 13 littoral rainforest sites situated between Myall Lakes National Park and Crowdy Bay National Park on the mid-north coast of New South Wales; 6 sites were located on geologically recent (Holocene) sands with the remainder established on exposed headlands and associated sheltered gullies on heavier soil types. The fauna of littoral rainforest is not as diverse as that generally to be found in montane, sub-montane and coastal plain wet forests surveyed to the west; whilst within littoral rainforest there is a reduction in faunal diversity from headland sites to those on Holocene sands. It is noted that there is an apparent paucity of vertebrates within littoral sites surveyed and that vertebrates, especially mammals, may play a less significant role in the foraging/food strategies of the resident scarabaeine and hybosorine dung beetle populations. The Aphodiinae appear to be absent from the littoral rainforests sampled.

Introduction

The previous Parts of our study surveyed small wet forests from Nowra to Newcastle (Williams and Williams, 1982) and montane, sub-montane and wet forests of the coastal plain from Buladelah to the Comboyne Plateau (Williams and Williams, 1983a, 1983b, 1983c). Part 5 of our study provides a preliminary assessment of the dung beetle fauna to be found in littoral rainforest sites from Myall Lakes National Park north to the Crowdy Bay National Park on the mid-north coast of New South Wales. As such, this Part complements the three previous Parts which covered wet forest sites situated progressively to the west.

The term "littoral" is loosely applied, within this study, to rainforests found in close proximity to the sea and established either on geologically recent (Holocene) sands behind frontal dunes, exposed headlands on heavier soils or on islands in enclosed saline waters (eg. Wallis Lake, Myall Lakes) (Williams and Harden, 1979; Baur 1965 and Clough, 1979). There is often a pronounced wind shearing of the frontal canopy at exposed headland sites with species, attaining heights in excess of 10 metres in sheltered positions, being reduced to less than 2 metres along the exposed windward barriers.

Rainforests growing on sands are dominated by *Cupaniopsis anacardioides* (A. Rich.) Radlk. (Sapindaceae) and frequently with "Coast Banksia", *Banksia integrifolia* L.f. (Proteaceae), as an emergent. In a study of littoral rainforest communities in the Myall Lakes district Clough (1979) generally found that rainforest vegetation on Holocene sands contained fewer plant species than sites on heavier soils and that structurally and floristically rainforest on sand was less complex. Of the six rainforest types recognized by Pople and Cowley (1981) as occurring in New South Wales, littoral rainforest was the poorest represented constituting only 0.5 per cent of their estimated total.

Littoral rainforest occurs frequently along the New South Wales north coast to the Queensland border. To the south of Myall Lakes National Park however it occurs uncommonly though it reaches the

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Beecroft Peninsula, Jervis Bay, on the south coast. Also to be found within this study area are a number of depauperate littoral rainforest "scrubs" composed of rainforest genera (eg. *Cupaniopsis, Glochidion, Rhodomyrtus*) in association with drier elements (*Leptospermum, Acacia, Bursaria* and *Exocarpus*). Examples of these are to be found to the north of Old Bar and to the immediate south of Harrington village, the last fringing an estuarine mangrove community. Such species poor low and open canopy "scrubs" may represent an early phase in littoral rainforest colonization. Clough (1979) considers that, in the Myall Lakes area "Holocene sand dunes were not developed until between 6000 and 3000 years before present" and therefore "rainforest on sand could not have existed until at least 6000 y.b.p."

Littoral rainforest, however, has been subjected to considerable disturbance along the New South Wales north coast. Some sites sampled in this study have undergone degrees of clearing for sandmining, agricultural use and residential development (eg. Elizabeth Beach and Crowdy Head) whilst several study sites have had the understorey removed to provide recreation reserves (eg. Manning Point-part, sand site adjoining Saltwater/ Wallabi Point). Most study sites are penetrated and bisected by vehicular roading of various types. It is estimated, for example, that prior to *c.* 1870 rainforest at Cape Hawke covered some 450 hectares. Of this some 54 per cent (245 ha) has been totally removed with only 18 per cent (79 ha) of the original estimated total area remaining undisturbed (Clough, 1979).

The only previous records for dung beetles from littoral rainforests of the area are those of Williams (1979) where, in remnant tracts at Harrington established on geologically recent sands, he collected *Onthophagus rubicundulus* Macleay, *O. tabellifer* Gillet, *Diorygopyx asciculifer* Matthews, *Notopedaria metallica* (Carter), *Lepanus australis* Mathews and the hybosorine *Liparochrus fossulatus* Westwood (as *L. bimaculatus* Westw.).

Capture results from baited pit-fall traps are given in Table 1. A map of study sites is also given (Fig. 1).

Table 1. List of study sited and species taken at each. (Dates of collection are followed by figures in parentheses indicating the number of specimens taken)

A. "Mungo Brush". Myall Lakes National Park. Dry type rainforest established on "drowned" mountain top. Sandy loam soil, rocky with light leaf litter. Surrounded by *Livistona* palm-Eucalyptus woodland.

Diorygopyx asciculifer Matthews. 26.x.1981, (122), at faeces and fresh fish flesh. Also in adjoining *Livistona-Eucalyptus* woodland.

Lepanus australis Matthews. 26.x.1981, (16), at faeces. Also in adjoining *Livistona-Eucalyptus* woodland.

B. Seal Rocks. Littoral rainforest situated between caravan park and village. Sand soil with heavy leaf litter cover. Adjoining *Eucalyptus* woodland.

Diorygopyx asciculifer Matthews. 28.i.1981, (approx. 130): 30.ix.1981, (45), at faeces and fresh fish flesh.

Lepanus australia Matthews. 30.ix.1981, (1), at faeces.

Notopedaria metallica (Carter). 28.i.1981, (2) at feaces.

Onthophagus leanus Goidanich. 28.i.1981, (5), at faeces.

Onthophagus neostenocerus Goidanich. 28.i.1981, (2), at faeces.

Onthophagus sydneyensis Blackburn. 28.i.1981, (4); 30.ix.1981, (3), at faeces and fresh fish flesh.

Onthophagus tabellifer Gillet. 28.i.1981, (3); 30.ix.1981, (2), at faeces.

C. Elizabeth Beach Reserve; Pacific Palms. Littoral rainforest remnant adjoining *Livistona* palm-*Eucalyptus* woodland. Sand soil with heavy leaf litter cover.

Diorygopyx asciculifer Mathews. 30.ix.1981, (11); 26.x.1981, (82), at faeces. Also in adjoining *Livistona-Eucalyptus* woodland.

Onthophagus arrilla Matthews. 26.x.1981, (1), at faeces.

Onthophagus auritus Erichson. 26.x.1981, (1), at faeces.

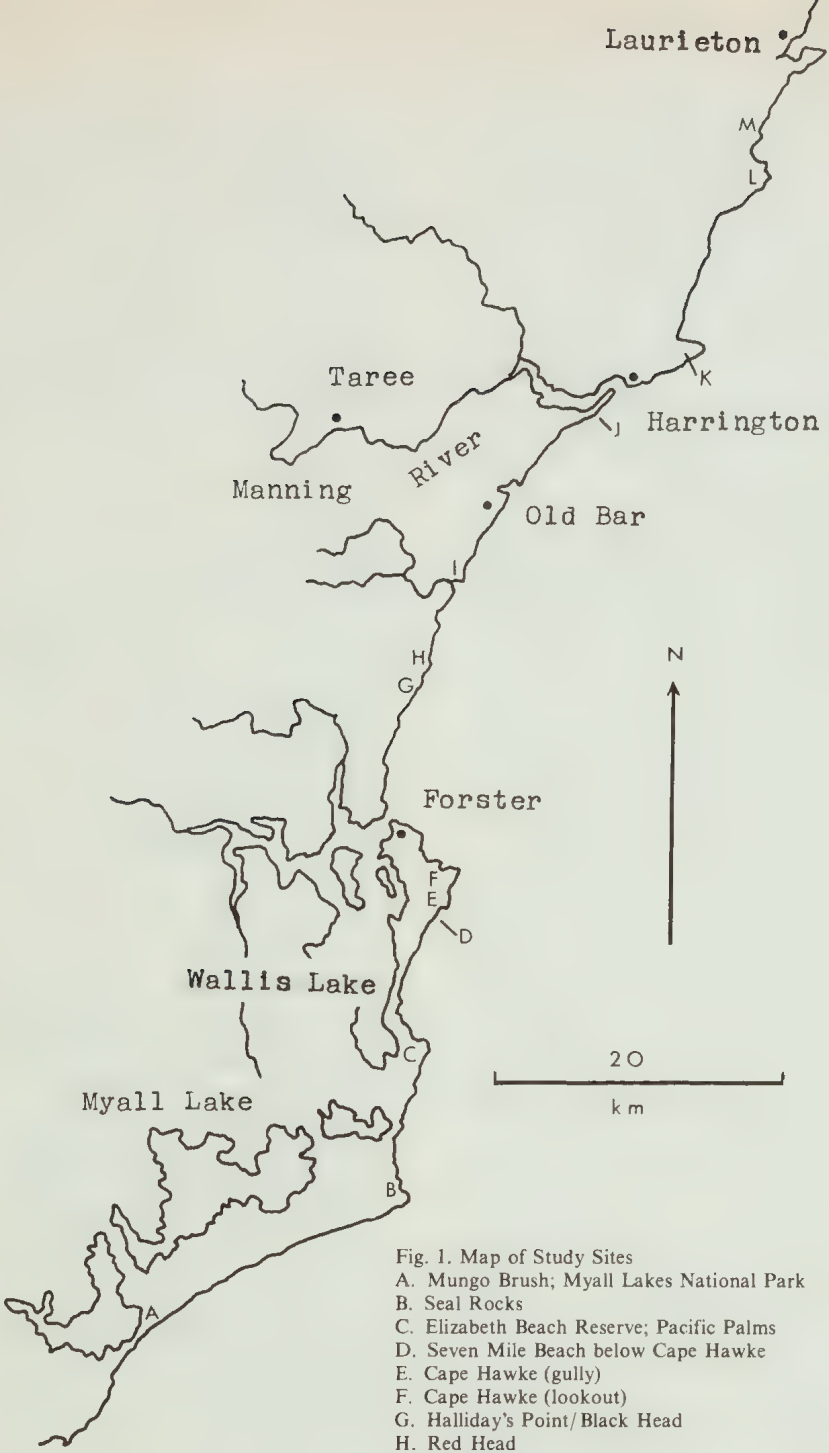

Fig. 1. Map of Study Sites
A. Mungo Brush; Myall Lakes National Park
B. Seal Rocks
C. Elizabeth Beach Reserve; Pacific Palms
D. Seven Mile Beach below Cape Hawke
E. Cape Hawke (gully)
F. Cape Hawke (lookout)
G. Halliday's Point/Black Head
H. Red Head
I. Saltwater/Wallabi Point
J. Manning Point Reserve
K. Crowdy Head (S.W. slope)
L. Diamond Head (sth. base); Crowdy Bay National Park
M. "Cheese Tree" Picnic Area; Crowdy Bay National Park

D. Northern end of Seven Mile Beach below Cape Hawke, Booti Booti State Recreation Area. Littoral rainforest remnant, sand soil with medium density leaf litter cover.

Liparochrus fossulatus Westwood. 30.ix.1981, (2), at faeces.

Diorygopyx asciculifer Matthews. 30.ix.1981, (11); 17.ii.1982, (24), at faeces.

Lepanus australis Matthews. 30.ix.1981, (1), at faeces.

Onthophagus arrilla Matthews. 30.ix.1981, (1), at faeces.

Onthophagus sydneyensis Blackburn. 17.ii.1982, (1), at faeces.

Onthophagus tabellifer Gillet. 17.ii.1982, (2), at faeces.

E. Approx. 1.5 km S.S.W. Cape Hawke, Booti Booti State Recreation Area. Gully restricted dry-subtropical rainforest complex. Brown sandy to clay loam with medium density leaf litter cover. Surrounded by *Livistona* palm-*Eucalyptus* forest.

Liparochrus silphoides Harold. 30.ix.1981, (1); 17.ii.1982, (4), at faeces.

Diorygopyx asciculufer Matthews. 30.ix.1981, (8); 17.ii.1982, (40), at faeces.

Monoplistes leai Paulian. 30.ix.1981, (2); 17.ii.1982, (2), at faeces.

Onthophagus neostenocerus Goidanich. 17.ii.1982, (1), at faeces.

Onthophagus sydneyensis Blackburn. 30.ix.1981, (3); 17.ii.1982, (1), at faeces.

F. Approx. 0.5 km W. Cape Hawke Lookout. Dry rainforest remnant surrounded by cleared grassy area and lantana thickets. Grey-brown clay loam, very rocky with medium density leaf litter cover.

Liparochrus silphoides Harold. 28.i.1981, (2), at faeces.

Onthophagus bornemisszai Matthews. 28.i.1981, (1), at faeces.

G. Halliday's Point (also know as Black Head). Dry type rainforest gully 0.1 km W. of Pebbly Beach. Established on clay-loam soil with medium density leaf litter cover.

Liparochrus fossulatus Westwood. 17.xi.1982, (2), at faeces.

Liparochrus silphoides Harold. 17.xi.1982, (2), at faeces.

Cephalodesmius armiger Westwood. 17.xi.1982, (5), at faeces.

Diorygopyx asciculifer Matthews. 13.x.1981, (27); 17.ii.1982, (63); 17.xi.1982, (20), at faeces and fresh fish flesh.

Lepanus australis Matthews. 13.x.1981, (2), at faeces

Lepanus bidentatus (Wilson)? 13.x.1981, (12); 17.ii.1982, (5), at faeces and fresh fish flesh.

Lepanus politus (Carter). 13.x.1981, (3), at fresh fish flesh.

Notopedaria scarpensis Matthews? 13.x.1981, (2), at faeces.

Notopedaria sp. 13.x.1981, (1), at faeces.

Onthophagus arrilla Matthews. 13.x.1981, (7); 17.xi.1982, (1), at faeces.

Onthophagus neostenocerus Goidanich. 13.x.1981, (9); 17.ii.1982, (3); 17.xi.1982, (1), at faeces.

Onthophagus pugnax Harold. 13.x.1981, (11), at faeces.

Onthophagus sydneyensis Blackburn. 13.x.1981, (5); 17.ii.1982, (3); 17.xi.1982, (5), at faeces and fresh fish flesh.

H. Red Head. Headland dry rainforest type adjoining *Eucalyptus* woodland. Grey-brown clay loam with medium leaf litter cover.

Liparochrus fossulatus Westwood. 17.xi.1982, (4), at faeces.

Cephalodesmius armiger Westwood. 17.xi.1982, (1), at faeces.

Diorygopyx asciculifer Matthews. 17.xi.1982, (19), at faeces.

Onthophagus arrilla Matthews. 17.xi.1982, (1), at faeces.

Onthophagus sydneyensis Blackburn. 17.xi.1982, (3), at faeces.

I. Saltwater (also know as Wallabi Point). Small headland restricted, dry rainforest type. Brown loam soil with medium density leaf litter cover. Adjoins the remnants of a littoral rainforest, developed on sand soil, cleared for a public reserve.

Liparochrus silphoides Harold. 22.x.1981, (2); 17.ii.1982, (1), at faeces.

Cephalodesmius armiger Westwood. 22.x.1981, (6); 17.ii.1982, (8), at faeces.

Diorygopyx asciculifer Matthews. 22.x.1981, (19); 17.ii.1982, (19), at faeces.

Lepanus australis Matthews. 22.x.1981, (1); 17.ii.1982, (1), at faeces.

Onthophagus auritus Erichson. 17.ii.1982, (1), at faeces.

Onthophagus capella Kirby. 22.x.1981, (1), at faeces.

Onthophagus pugnax Harold. 22.x.1981, (4), at faeces.

Onthophagus sydneyensis Blackburn. 22.x.1981, (5); 17.ii.1982, (10), at faeces.

J. Manning Point. Littoral rainforest on sand soil with medium density leaf litter cover.

Diorygopyx asciculifer Matthews. 22.x.1981, (39); 17.ii.1982, (10), at faeces.

K. Crowdy Head. Small remnant on the immediate S.W. slope of headland. Dry-subtropical rainforest, grey clay loam with heavy leaf litter cover. Surrounded by cleared grassed pasture.

Lepanus australis Matthews. 28.ix.1982, (4); 25.i.1983, (2), at faeces.

L. S. base of Diamond Head; Crowdy Bay National Park. Dry-subtropical rainforest, narrow sandy loam belt fringing a rock scree/brown loam slope. Rainforest adjoins a *Banksia*-heath association to the west.

Liparochrus fossulatus Westwood. 20.x.1982, (1); 7.iii.1983, (32), at faeces and frog droppings.

M. "Cheese Tree" Picnic Area: Crowdy Bay National Park. Littoral rainforest on sand soil, light to medium leaf litter cover.

Liparochrus fossulatus Westwood. 20.x.1982, (3); 7.iii.1983, (1), at faeces and rotting bananas.

Diorygopyx asciculifer Matthews. 20.x.1982, (39); 7.iii.1983, (19), at faeces.

A summary of the species encountered, and grouped under basic site soil types, is given in Table 2. The two soil groupings equate roughly with the rainforest subtypes; *Cupaniopsis* dominated rainforests behind frontal dunes and structurally and floristically more complex rainforests on exposed headlands. Rainforest remnants at Crowdy Head and the Harrington Crowdy Head road are illustrated (Figs. 2 and 3).

Table 2. Summary of species encountered. (Species are tabled under the two main soil types occurring within the study area; letters indicate study sites)

Family Scarabaeidae	clay-loam/loam	sand
Subfamily Hybosorinae		
Liparochrus fossulatus Westwood	G,H,L	D,M
Liparochrus silphoides Harold	E,F,G,I	absent
Subfamily Scarabaeinae		
Tribe Onthophagini		
Onthophagus arrilla Matthews	G,H	C,D
Onthophagus auritus Erichson	I	C
Onthophagus bornemisszai Matthews	F	absent
Onthophagus capella Kirby	I	absent
Onthophagus leanus Goidanich	absent	B
Onthophagus neostenocerus Goidanich	E,G	B
Onthophagus pugnax Harold	G,I	absent
Onthophagus sydneyensis Blackburn	E,G,H,I	B,D
Onthophagus tabellifer Gillet	absent	B,D
Tribe Scarabaeini		
Cephalodesmius armiger Westwood	G,H,I	absent
Diorygopyx asciculifer Matthews	A,E,G,H,I	B,C,D,J,M
Lepanus australis Matthews	A,G,I,K	B,D
Lepanus bidentatus (Wilson)?	G	absent
Lepanus politus (Carter)	G	absent
Monoplistes leai Paulian	E	absent
Tribe Coprini		
Notopedaria metallica (Carter)	absent	B
Notopedaris scarpensis Matthews	G	absent
Notopedaria sp.	G	absent

Fig. 2. Remnant gully rainforest on S.W. slope of Crowdy Head (site K)

Fig. 3. Littoral rainforest remnants along the Harrington Crowdy Head road. Remnant patches of rainforest are the dark rectangular areas behind the beach dunes in the central and upper left section of the aerial photograph. There is a large isolated patch in the bottom right corner of the photograph immediately adjoining Harrington village

Discussion

Thirteen sites were sampled in this part. These can be divided into two simplistic groups on the basis of soil type/location; those occurring behind frontal dunes on nutrient enriched Holocene sands (Seal Rocks, Elizabeth Beach, Cape Hawke (D), Manning Point and "Cheese Tree"), and those developed on heavier soils on exposed headlands and associated sheltered gullies (Cape Hawke (E,F), Halliday's Point, Red Head, Saltwater, Crowdy Head and Diamond Head). Mungo Brush was originally a saline lake island that has only recently been connected to an adjoining sclerophyll woodland (Osborn and Robertson, 1939) and on the basis of soil type is grouped with the headland sites, in Table 2.

By comparison with the fauna recorded from montane and near-coast sites to the west (see Parts 2, 3, 4) the dung beetle fauna found within littoral rainforest sites is a reduced one in both generic and species diversity, though still considerably more diverse than the fauna encountered at the cool temperate sites (Moppy Lookout and Mt. Allyn Forest Park in Part 2) sampled to date, where *Aptenocanthon, Amphistomus* and *Onthophagus* are the only scarabaeine genera recorded by us. *Aulacopris* and *Amphistomus*, genera present at submontane wet forests in Buladelah and Lansdowne State forests to the near west (Williams and Williams, 1983b, 1983c) are apparently absent from littoral rainforests.

No genera are restricted to littoral rainforests within this study area. However two species, *Onthophagus tabellifer* Gillet and *Notopedaria metallica* (Carter), were recorded by us only from littoral rainforests on Holocene sands. Neither species was taken for headland sites nor have they been trapped at near-coast and montane study sites recorded in previous Parts of this study. The known range of *O. tabellifer* extends from Bateman's Bay, southern New South Wales, to Harrington on the mid-north

coast and has only been recorded from sand soils in close proximity to the sea. *Notopedaria metallica* is recorded from southeast Queensland and northeast New South Wales penetrating inland as far as Yarraman (Qld.) and the Gibralter Range (N.S.W.) in the northern part of its distribution (Matthews, 1976). In this northern section of its range *N. mettallica* has been recorded from heavier soil types (Matthews, 1976; Allsopp, 1975) such as clays and loams.

Within the littoral rainforest fauna there was a reduction in diversity from "headland" sites to those on Holocene sands with *Monoplistes*, and noticeably *Cephalodesmius*, being absent from the latter. Species presence at sites is frequently correlated with soil type (Table 2); for instance, *Onthophagus pugnax* Harold and *O. tabellifer* Gillet (and to a lesser extent *Liparochrus silphoides* Harold and *L. fossulatus* Westwood) were found to be mutually exclusive. Due to the clearing of original rainforest area since settlement the dung beetle fauna is very reduced at some sites (eg. Crowdy Head). However at two of the more expansive and least disturbed sites, Mungo Brush and Diamond Head, the dung beetle fauna is also very impoverished with no scarabaeine species yet recorded from Diamond Head, thus faunal impoverishment cannot solely be explained as a reflection of spatial reduction or disturbance to the sites.

Diorygopyx asciculifer Matthews was commonly present at the majority of littoral rainforest sites though inexplicably absent during sampling from the Diamond Head site (site L). *Diorygopyx asciculifer* was encountered at most of our study sites within the Manning valley and associated hinterland (see Parts 2, 3 and 4). Although not taken in cool temperate rainforest and depauperate tracts in Yarratt State forest (Williams and Williams, 1983a, 1983b) it dominated the fauna in the littoral rainforests. That *D. asciculifer* populations "peak" in littoral rainforest suggests the species is at least a topographic halophile (as defined in Thiele, 1977). *Diorygopyx asciculifer* was also trapped in palm/*Eucalyptus* forest adjoining the rainforest at the Elizabeth Beach Reserve and Mungo Brush.

A number of interesting records were obtained especially from headland rainforests and several of these provided the first instance of the inclusion of littoral zones within the distribution of several species. Species and generic diversity was particularly rich at Halliday's Point where sampling was undertaken in a sheltered clay-loam gully. Six genera (*Onthophagus, Notopedaria, Lepanus, Cephalodesmius, Diorygopyx* and *Liparochrus*) and eight species occurred. The faunistics at the generic level, of the Seal Rocks site situated on recent sands, are similar to those at the Harrington rainforests (Williams, 1979) further to the north, though *Liparochrus* is apparently absent from Seal Rocks. All three scarabaeine tribes are present at both sites but *Onthophagus leanus* Goidanich, *O. neostenocerus* Goidanich and *O. sydneyensis* Blackburn were not recorded by Williams (1979) from Harrington. Though Williams (1979) took *O. rubicundulus* Macleay at the Harrington rainforests, where he found it to be common, it has not been trapped in the additional littoral rainforests of the region which were surveyed in this Part. *Onthophagus kiambram* Storey, a common element of wet forest sites to the west (see Parts 2, 3 and 4), was not trapped in littoral rainforests.

On occasion a range of bait types were offered simultaneously; many proved unsuccessful and these included sheep droppings, crushed fresh lantana flowers fresh applecores and sliced fallen fruits of "Black Apple", *Planchonella australis* (R.Br.) Pierre (Sapotaceae). Baits used with some success in rainforests at Harrington (Williams, 1979) but not used by us included commercial mushrooms (*Agaricus* sp.) and rotting marine molluscs (*Plebidonax*). Fallen rainforest fruit was

searched for beetles at several sites but the only record gained, for species at fruit, was one individual (perhaps fortuitously) of *Liparochrus fossulatus* Westwood entering a pit-trap baited with over-ripe bananas. Of interest was the occurrence of 5 adults of *L. fossulatus* at a pit-trap baited with a small sample of frog droppings (< 1 gram) at Diamond Head and the avoidance of a trap baited with over 15 grams (wet weight) of sheep droppings placed less than 6 metres away.

Of interest also is the question of food availability for the beetle fauna. Though the littoral sites are relatively small and geographically isolated, in addition to being greatly disturbed, their dung beetle faunas are primarily wet forest restricted and do not generally enter adjoining xeric plant communities. At least one species, *Diorygopyx asciculifer*, occurs in most sites in high population numbers. Williams (unpubl. data) found, for example, that *D. asciculifer* entered traps at Harrington in such great numbers as to make accurate counting impractical. That this species is also flightless further compounds the issue as "the relatively low probability of finding food in a given time requires that the food be exceptionally abundant and in stable supply" (Matthews, 1974), for flightlessness imposes a foraging disadvantage on *D. asciculifer*. However, no large resident animals occur in the littoral rainforest study sites though some may enter littoral rainforests from adjoining habitats where clearing or disturbance has not been severe. Birds are common at several sites but the largest resident vertebrates appear to be the "Brush-tailed" possum *Trichosurus vulpecula* (Kerr) (Phalangeridae), and the goanna lizard *Varanus varius* (Shaw) (Varanidae).

Extensive field traverses at several sites (and over a period of ten years at Harrington) indicated that vertebrate populations, excepting birds (and *Varanus varius* at Manning Point where it is common), in littoral rainforests were very low or composed primarily of small cryptic or nocturnal species with occasional large macropods and domestic animals intruding from adjoining habitats; so that mammals especially can be seen at best as providing only a very localized (in both space and time) food resource in the form of excrement, to the beetles. A range of trophic deviations have been recorded in the literature for many Australian species and at least one genus, *Cephalodesmius*, synthesizes "dung" from fallen vegetable matter (Monteith and Storey, 1981) so that dung beetle populations within littoral rainforests are possibly utilizing a broad spectrum of food material (eg. cadavers, excrement, fungi and vegetable matter) as these either become enviromentally available or are encountered during foraging activities.

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The Swamp Fern *Thelypteris confluens* (Thelypteridaceae), a New Species Record for Victoria

BY J. G. GREEN* AND N. G. WALSH**

We report the discovery of the Swamp Fern *Thelypteris confluens* (Thunb.) Morton from a subalpine bog near Tawonga, northeast Victoria. This is the first record in Victoria and apparently only the fourth in Australia of this largely tropical fern.

Description of the fern

The fronds of *T. confluens* are normally twice pinnate and narrow-triangular in outline, up to 80 cm long and are usually held stiffly erect. The stem is mostly smooth and pale straw coloured, with the base purplish or nearly black and usually bearing a few small brown scales. The leafy part of the frond occupies only the upper 1/2-2/3 of the stem and the pinnae (frond-branches) are more closely spaced near the apex than the base. The pinnae are oblong, up to 5 cm long and about 1 cm broad, with 10-25 narrow-triangular lobes (pinnules), which are incised almost to the midvein of the pinnae. The margins of the pinnules are usually slightly recurved or pronouncedly so in fertile specimens. The lower surfaces usually have a few oval scales near the midvein (see Fig. 1b). The sori (spore masses) occur near the margins on the lower surfaces of the pinnules. Each sorus is protected by a centrally attached, fringed, circular scale or indusium, which becomes almost hidden as the dark brown sporangia open to release their spores. The rhizome is long-creeping, usually just below the surface of the sphagnum bed. Like the bases of the stems, the rhizome is dark brown and sparsely covered with small scales. The lateral rootlets from the rhizome are usually covered by fine, rust-coloured hairs.

In Victoria the family Thelypteridaceae is also represented by *Christella dentata* and *Pneumatopteris pennigera,* both rare ferns inhabiting limestone tracts. In Australia, *Thelypteris confluens* is the only representative of the genus. It has been collected from three localities in

* 47 Nicholson St., Nunawading, Victoria, 3131.
** National Herbarium, Birdwood Ave., South Yarra, Victoria, 3141.

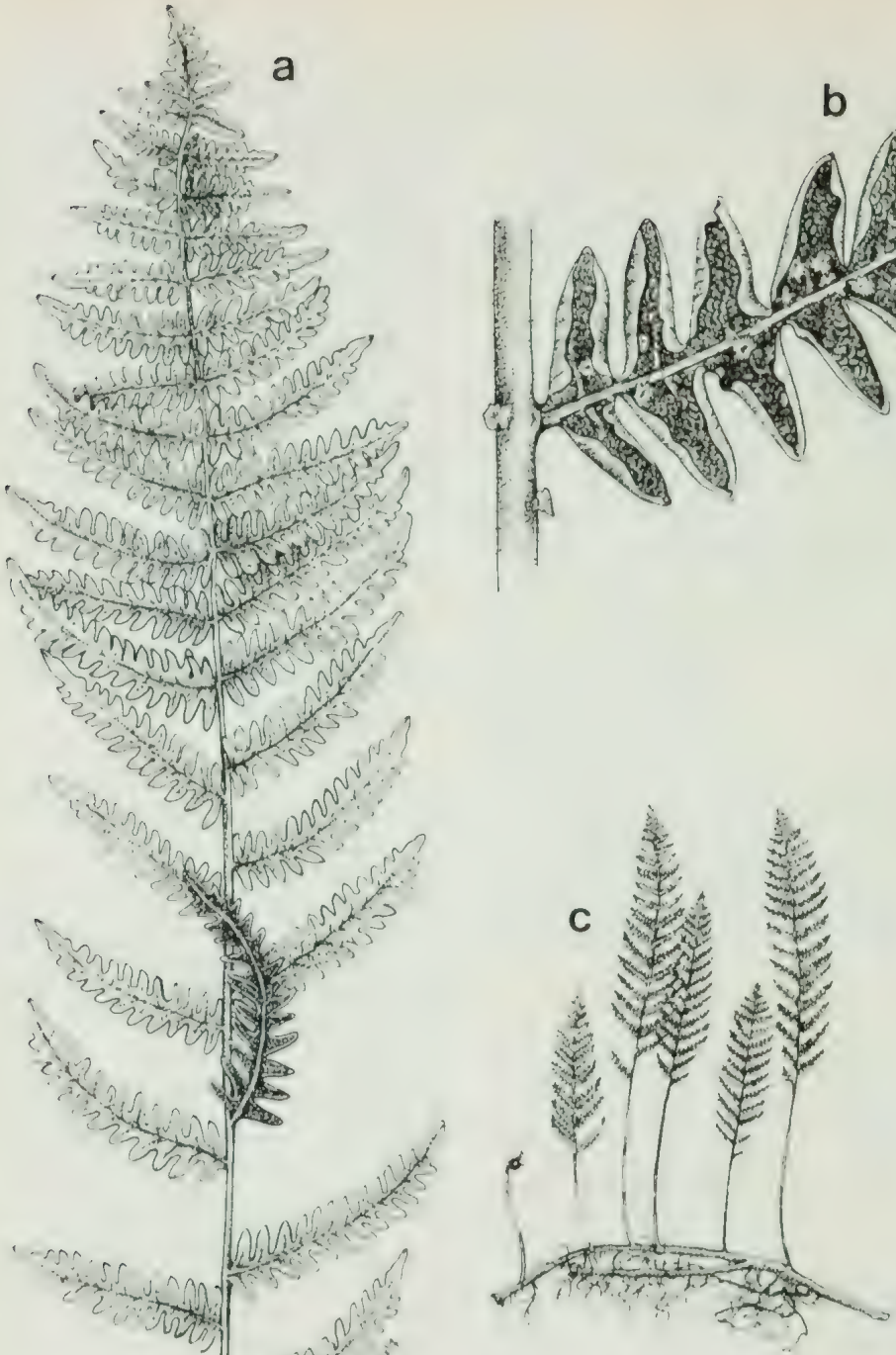

Fig. 1a. Upper section of frond of *Thelypteris confluens*. (x1)
Fig. 1b. Underside of fertile frond showing sporangia, indusia and scales. (x5)
Fig. 1c. Habit sketch. (x1/10)

southeast Queensland on Stradbroke Island and near Gympie (Ross, Queensland Herbarium, pers. comm.). Otherwise the species occurs in South America, Africa, India, Papua New Guinea and New Zealand.

Habitat

The community in which the fern was found is based upon a deep, peaty substrate of living and dead *Sphagnum cristatum*. Dominant shrubs include the Alpine Bottlebrush *(Callistemon sieberi)*, Swamp Heath *(Epacris paludosa)* and Mountain Baeckea *(Baeckea utilis)*. These species are characteristic members of wet heathlands and swamp margins throughout the Victorian alps, typically at altitudes above 1000 m. Their occurrence at the Tawonga site is remarkable as the altitude is only 300 m. Other, more widespread species include the Common Reed *(Phragmites australis)*, a rush *(Juncus sarophorus)* and the Austral Crane's-bill *(Geranium solanderi)*. The bog is bordered on one side by cattle-grazed pasture and on the other by a reedy fen. A few common weed species are frequent in these areas and have invaded the bog to some extent. Rowe (1968) gives a fuller, contemporary account of this interesting community. Kershaw and Green (1983) have documented the history of the site for the past 8000 years.

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Naturalist Review

What Fossil Plant Is That? A Guide to the Ancient Floras of Victoria

BY J. G. DOUGLAS. Field Naturalists' Club of Victoria, Melbourne. 1983. $9.95

This is a timely and useful guide, both for amateur fossil hunters and professional palaeobotanists. In fact all who are interested in the plants which successively clothed our landscape, will find this publication of interest. The geological sections and those parts of the text dealing with the actual fossils are well presented and informative. However, I personally found the general botanical aspects, including the brief description and illustrations of the plant kingdom, much less satisfactory. This part could have been omitted without detracting from the text.

The earliest known plants from the Silurian-Early Devonian times are clearly illustrated with excellent photographs. The landscape reconstruction, while admittedly speculative, helps the reader to visualise what these long-past environments may have been like. However, "Alga" (Fig. 17), "rounded, structureless mass, up to 30mm in diameter, commonly smaller, usually in clusters" is not a suitable subject for line and dot drawing. These mysterious blobs can only be illustrated satisfactorily by photographs of the rock specimens themselves. At the present state of our knowledge, it is pure speculation that these blobs were in fact algae.

Some sections of this book, such as those dealing with the Late Devonian and Early Carboniferous, reflect the relatively little detailed information we have on these floras. It would be difficult for an amateur, given Table 6 and the list of names and affinities of these plants, to identify them from this book; a number are visible in the restructured scene presented for the Late Devonian period, but the text does not clearly identify them with the drawing.

Of the various geological periods dealt with, the Early Cretaceous is the most thorough, no doubt a reflection of Dr Douglas' own area of expertise. It is largely through his research that we know so much about these Cretaceous floras in Victoria. Further, they are of special interest in that our Bass Strait oil and gas deposits are

preserved in sedimentary rocks of this age and so our economic fortunes as a nation are associated with these now long past environments. Again, there are interesting and helpful composite drawings of successive geological scenes which give the reader some idea of the fascinating and remarkable changes in the vegetation of what today is the Victorian region of the Earth.

In plates 8 and 9, photographs and photomicrographs of fossils of both plant and animal remains are presented. Some of these illustrate the beauty and precision of form revealed by modern techniques of microscopy and electron microscopy, techniques well and truly beyond the range of the amateur, but other illustrations on this page warn of the traps in misinterpretation — for example in mistaking animal remains for plants. A serious omission here is the beautiful dendritic, crystalline patterns caused from the infiltration of minerals that are so often mistaken by beginners for alga-like patterns. These certainly would have been worth illustrating. A whole page (plate 9) is devoted to a superb photograph of a fossil feather from the Lower Cretaceous. In a book on fossil plants, it is doubtful whether this feather justifies a full page illustration.

This booklet is attractively produced, clearly printed on good quality paper and it seems likely that future editions will benefit from the studies which might be stimulated by readers of this work. It is a pity that there is not a clearer message requesting restraint from digging in type localities and in areas designated as geological and as National Estate monuments. There is such a message in the present edition but it is not until the reader reaches page 70. Another message is needed to guide the informed amateur to organisations who are responsible for holding and documenting collections and who also co-ordinate research on new discoveries. After all, I would hope that a guide such as this would be part of the kit of every bulldozer driver working for our roads boards and a copy should also be in every shire engineers' office. For the information these people so often unwittingly reveal can contain significant fossil discoveries and these are not the property of any private individual. The knowledge they enshrine of the early forms of life on earth are surely the property of the universe.

T. C. CHAMBERS

Field Naturalists Club of Victoria

Reports of recent activities

General Meeting
Monday, 19th March

Speaker for the evening was Dr Jim Willis who described many of the natural (and sometimes historical) features to be found on a number of Australia's offshore islands from south-west Australia and the southern coast up to north-east Queensland. It was explained that an offshore island differs from an oceanic island in that it is a remnant of the mainland mass and therefore often shares many of the adjacent mainland's features.

Rottnest Island, near Perth, once housed a jail. Being an island of limestone many of the buildings there are built out of the native rock, such as the lighthouse. This island is well-known for the Quokka, a type of short-tailed wallaby which is common there.

Off Esperance lies the Recherche Archipelago, a group of more than 150 islands which Dr Willis visited in 1950. The relatively simple ecology of one of the islands was highlighted; the dominant vegetation, peppercress, swarms with grasshoppers which are eaten by King's skink. The large deposits of manure which are left by the lizards provide nutrients for the peppercress. Remark island is the highest island in the group, boasting a sheer cone of 700 feet. Around its base are forests of Bushy Yate.

Other plants found on these islands also occur naturally in Victoria, such as *Melaleuca lanceolata* (Moonah), Clematis, and the Blotched Sun Orchid, seen at Anglesea after the recent fires there. *Kunzea baxteri,* now commonly grown in gardens in Victoria was first

cultivated from seeds collected by Dr Willis from Mongraine island in 1950.

Although extensively cleared Kangaroo Island still retains 23 species of Eucalypt including a purple form of *E. lansdowneana* which is endemic to the island. Road verges are important refuges for the vegetation. There are approximately thirty species of endemic plants on kangaroo Island, including *Xanthorrhea tateana, Boronia edwardii* and *Correa pulchella.* This island is also the most westerly point of the distribution of *Epacris impressa.*

Kangaroo Island contains some interesting geological features such as the Kelly Hill caves, Admirals Arch (a waveworn limestone deposit on top of pre-Cambrian rocks), and other numerous granite boulders and monoliths.

Dr Willis pointed out that soldier settlement of King Island in the 1950s meant that vast areas of the island were cleared and subsequently the Celery-topped Pine, *Phyllocladus asplenifolius* (with cladodes instead of leaves) was brought to extinction. On a similar note are the petrified forests of calcified tree roots and trunks which occur in the south-east corner of the island.

On the Victorian south coast can be found islands of the smallest kind — tiny rock stacks such as the '12' apostles. The 'London Bridge' shows the process of formation of these stacks. On Gabo Island off Victoria's far east coast can be found one of this State's rarest ferns, *Asplenium octusata* with its leathery fronds which enable it to withstand a constant dousing with salt-laden water.

Dr Willis then took us straight up to Queensland (there is a paucity of islands off the N.S.W. coast) where we were treated to the tropical vegetation and coral reefs of Stradbroke, Dunk (home of E. J. Bamfield), Green and finally Lizard Islands, where giant clams (5-6 feet across) can be viewed through glass-bottom boats.

Dr Willis illustrated his talk with a host of colourful slides and also had on display a number of seashells and several books on the natural history of Kangaroo island.

Exhibits: Under the microscope were displayed mosquito wrigglers and *Cironomus* (fly) larvae. At X100 magnification was shown diatoms (Pleurosigma) and examples of other microscopic marine life (red ciliates, foraminiferans, and rounded flat worms). Under low power the hydroid *Aequorea* was shown in a dish where it has been growing since November, 1982.

Other exhibits were:—

— two water snails (from Main Creek, Mornington Peninsula and from the King River) and a land snail (family Chiropidae) from the Yea River.

— a live land hermit crab.

— the freshwater liverwort *Ricciocarpus* from the Yarra River at Kew.

— a number of fossils from the Cape Liptrap camp including the graptolite *Monograptis* and a 'woody fossil' which may be *Buthotrephis* (oldest Victorian plant known).

Nature Notes: The Lesser Wanderer butterfly was reported to be in large numbers at Cape Schanck. An orb weaver spider with two legs missing was seen to have constructed an unusually shaped web, and at Creswick mayflies were seen emerging from trees.

General Meeting
Monday, 16th April

Speaker for the evening was David Cameron who outlined the significant features of the Errinundra Plateau. David grouped these features under 15 headings ranging from geographic and wilderness significance to examples of rare flora and fauna which are known to exist there.

The great floristic richness of East Gippsland was highlighted — although comprising only 4% of the State's total area it contains well over half of the species occurring in the State. Errinundra stands out in a State which is otherwise deficient in forested montane plateaus. The high wilderness value of the area was stressed — slides were shown of a 150 foot

high waterfall on First Creek, which, as far as David is aware was first seen only two years ago on a stream survey.

In terms of ecological significance approximately 30% of the plateau is of the unique mixed forest type, with an overstorey of eucalypts e.g. Shining Gum, and an understorey of rainforest species e.g. Sassafras. Compartment 3, comprising 4% of the total area of the Errinundra is the largest remaining area of mixed forest and David gives it a high priority for preservation.

The cool temperate rainforest that occurs on the plateau (above 1000 metres) is dominated by Sassafras, with Black Oliveberry *(Elaeocarpus holopetalus)* and emergent Blackwoods up to 150 feet. Treeferns are abundant and the ground is covered with *Blechnum* ferns. The fact that this rainforest is dominated by Sassafras (and not Nothofagus as elsewhere in Victoria) makes it unique.

A 'most peculiar' vegetation type is the Podocarp thickets, dominated by *Podocarpus lawrencei,* that occur on the Goonmirk Range. In the Alps this plant typically occurs as a sprawling shrub — here it grows to heights of 17.5 metres (of the order of 1000 years old). Such uncharacteristically gargantuan proportions can be seen in a number of other species on the plateau, including *Leucopogon suaveolens, Tasmannia lanceolata, Pittosporum bicolor, Lomatia fraseri* and *Polyscias sambucifolius.*

Unfortunately time did not permit David to give all of his intended talk, but one last feature that he noted was the occurrence of Silver Wattle forests with an understorey dominated by *Poa* grasses — a parallel of the beech forests of the northern hemisphere.

Exhibits and Nature Notes: Displayed under the microscope was the foraminiferan *Boderia turneri,* showing the streams of protoplasm (myxopodia), and a Pycnogonid (sea spider) which feeds on hydroids. Two types of polychaete worm, Sabella and Nereid, were on show side by side in a petri dish.

Another exhibit under low power microscope was the eggs, caterpillars and moths of leaf skeletonizers. Interestingly, some of the eggs had been parasitized by minute wasps. Also on display was a brown moth and cup moth cocoons.

Other exhibits were:—
— the single-celled *Euglena* under high-power microscope
— a cone from a Bunya pine, *Araucaria bidwilli* and a number of beetles collected from around Lismore, N.S.W.
— lacewing eggs on a twig.

There were a number of reports of unusual butterfly sightings. With the warm weather it appears that some species are coming down from the North.

Annual General Meeting
Monday, 14th May

The President's report for 1983/84 was read by Wendy Clark, some major points being:—
— the publication of the centenary issue of the Naturalist
— the transfer of membership records onto computer
— publication of the fossil book
— introduction of joint camps/excursions
— the awarding of five honorary memberships to members on completion of 40 years with the Club
— the awarding of the Australian Natural History Medallion to Trevor Pescott
— special thanks to the Secretary and Treasurer for the hard work they have put into the Club.

Individual Group reports were also read.

The Treasurer's report was then read by the new Treasurer Noel Disken. In short — although 1983 was a difficult year financially, the financial affairs of the Club are still very healthy.

(See elsewhere in this issue for full reports).

An award was presented to Dan McInnes for his tireless efforts for the

Club. Tom Sault noted that as Treasurer Dan made a substantial amount of money for the Club through some 'shrewd manipulations'. He later carried on his money-making ventures as Book Sales Officer, a position he has only recently retired from. On receiving his award Dan outlined the history of the Club's book sales, including the Club's own publishing ventures. This has been an extremely worthwhile exercise for the Club, both financially and in terms of the quality of material published. Dan was awarded a copy of "Mammals of Australia" which he presented back to the Club.

Election of Office-bearers and Council members.

Officers elected: President Wendy Clark, Vice-President Brian Smith, Secretary Sheila Houghton, Treasurer Noel Disken, Editorial Committee: Joan Phillips, Lance Williams, Dianna McClellan, Peter Lawson, Russell Thomson, Excursion Secretary Marie Allender, Programme Secretary Christine Shankly. Offices vacant: Assistant Secretary, Assistant Treasurer, Librarian, Assistant Librarian.

Council Members: S. Houghton, N. Disken, M. Allender, C. Shankly, Bertram Lobert, Margaret Potter, William Rocke, Helen Stanford, Ian Faithful, L. Williams, plus the President (W. Clark).

Other positions: Minute Secretary (General Meetings) Alice Walker, Conservation Co-ordinator Malcolm Turner, Club Reporter: L. Williams, C.C.V. representatives M. Turner, I. Faithful, L. Williams. The position of Information Officer (General Meetings) is vacant.

Thanks were extended to Marie Allender, in her 30th year as Excursion Secretary, for the tremendous amount of work she has put in.

Giving the Presidential Address Wendy Clark spoke on 'Techniques for Photographing Wildlife' a subject she has been studying for the past two years.

Basic principles such as focussing and correct lighting were discussed as well as somewhat more specialized techniques such as the use of synchronized flash and macro photography. Mention was also made of a number of handy 'tricks' such as the use of clear plastic for diffusing sunlight and the bouncing of flash off white paper to minimise shadow with small objects. Many slides were shown to present the different uses of wildlife photography (e.g. illustration, identification, aesthetics) and also to illustrate the mistakes that can be made.

Conservation: Malcolm Turner brought to the attention of the meeting, the release of a joint draft zoning plan by the National Parks and Fisheries and Wildlife concerning the establishment of marine and wildlife reserves around Wilsons Promontory and Corner Inlet. The report calls for comments and it was felt that the Club should make a submission.

Exhibit: There were a number of exhibits as follows:—

— Lemon gall wasps (X20 magnification)

— a little sea centipede *(Paridotea munda)* in a petri dish.

— under the high power microscope was the rotifer Asplanchna and also a male pycnogonid with egg clusters attached to its ouigerous legs

— a number of specially designed containers in which insects, etc may be exhibited

— under low power magnification a stalked jellyfish from the family Lucernaridae

— several types of quartz crystal rock from Mount Gee, in the Flinders Ranges

— a live, potted specimen of Smilax *(Asparagus asparagoides)* an introduced plant which is potentially dangerous to native vegetation, and a piece of wire-leaf mistletoe.

F.N.C.V. ANNUAL REPORT
1983/84

This has been a very successful and busy year, which can be attributed largely to the hard work of the councillors, office-bearers and other associated members.

This year saw the centenary of *The Victorian Naturalist:* a milestone in anyone's estimation. It was an honour to be President in that year. A special Centenary issue was produced to coincide with the completion of the hundred years of publication, containing a facsimile of Vol. 1 No. 1, a history of the journal and its editors, and an article on the changing attitudes towards nature as reflected in *The Victorian Naturalist* during this period. Our thanks go to Dr Brian Smith for producing that issue so well; and also to the Editorial Committee which took over after the resignation of the Editor, Rob Wallis, in June last year. They have worked with much enthusiasm and interest to maintain the standard of our journal.

This year also we joined the technological age, transferring our membership records to a computer. The July/August issue of *The Victorian Naturalist* was the first to have computer-produced mailing labels. Benefits not only include lower costs but also easier access to membership categories, and the extraction of information concerning members' interests and specialities. Our Secretary, Mrs Sheila Houghton, put a great deal of time and energy into making this project work smoothly, and thanks must also go to the members who assisted with the mailing labels.

The long-awaited appearance of the book *What Fossil Plant is That?,* by Dr Jack Douglas occurred just before Christmas. It is a very fine publication. Unfortunately the undertaking was beset by problems. The printer to whom we gave the job failed to meet the scheduled date in June, and finally in October we retrieved the unfinished work and manuscript after the printer admitted he was unable to give a completion date. Our grateful thanks go to Jenkin Buxton, our regular printers, who completed the task in six weeks. Council is still trying to settle matters with the original printer, who received $2,400 in advance payment. Once again our Secretary was required to put much time and effort into dealing with this business.

Five Honorary memberships were awarded this year to commemorate 40 years membership of the Club. They went to Mr Eric Muir, Dr William Geroe, Mr Thomas Byrne, Mr W. H. Fulton and Mr Andy Blackburn.

The Australian Natural History Medallion was awarded to Mr Trevor Pescott for his outstanding contribution to natural history study and the conservation of wildlife and its habitat.

Two of our members received the Order of Australia, Mr Cliff Beauglehole and Mr Edward Heffernan.

Topics covered at General meetings ranged from the Plankton of an Antarctic fiord to the Little Desert, from the Use of Plants by Victorian Aborigines to Birdlife of North America, very interesting talks being given by experts in these fields. The September meeting was devoted to Bushfire Recovery and Regeneration, at which the Club Special Interest Groups presented their observations of the after-effects of the bushfires of the previous summer.

A new approach to excursions and camps was made, with emphasis on combining fields of interest to provide sufficient variety for members. One notable trip was a joint camp to the Snowy Range led by Dr Jim Willis and John Milligan over the Australia Day weekend. We were joined on that occasion by the Yea F.N.C. Other excursions included two very successful weekends with the VFNCA at Ocean Grove and Creswick; extended

visits to Lord Howe and Norfolk Islands, and to King Island; day trips to the Botanic Gardens annexe at Cranbourne, Phillip Island and French Island.

The Special Interest Groups continued to be active with varied meetings and excursions.

And what of next year?

This year great emphasis was put on advertising the Club through newspapers, various directories of clubs and local events, and a stand at the Royal Melbourne Show, with good results. This will be continued and expanded where possible. A Nature Show in the Spring should be aimed for.

More effort will need to go into dealing with conservation issues.

Efforts were made during 1983-84 to improve communication between the main club and the Special Interest Groups, with the aim of drawing them into a more unified whole. Further emphasis will be put on this to facilitate the dissemination of information.

Plans are already in hand for further joint camps and excursions, not only to cater for members' varied interests, but to encourage the collection and recording of useful data for future use.

Finally my thanks go to the retiring Council and Office-Bearers, particularly to the Secretary, Mrs Sheila Houghton, and the Treasurer, Mr David Dunn, who have borne the heaviest load during the year.

Wendy Clark
President.
14th May 1984.

Treasurer's Report

Annual General Meeting
May 14th, 1984

Financially, 1983 was a difficult year. Costs have increased and receipts decreased.

Expenditure exceeded Income, the shortfall being made up by the use of more than half the Treasury Grants being held in reserve.

The increased subscription rates for 1984 were necessary.

Surpluses of the Funds were average with the exception of Special Funds which were increased by:—

(1) A generous bequest from the late Mrs Matches.

(2) Proceeds from Marie Allender bargain tables at meetings added to the Kinglake Project Fund.

The Publication Fund must pay for the costs of publishing of the Fossil Book during 1984.

Subscription reminder notices are still costing the Club a large amount and making a lot of extra work.

The financial affairs of the Club are very healthy at present but spending must be watched closely this year.

David Dunn
Treasurer

Day Group Annual Report — 1983

Our Group is somewhat different from other Club groups — its main purpose being to provide a link with the Club, especially for some of the older members unable to attend evening meetings.

Outings are governed by the use of public transport so sometimes are a little limited as far as nature study areas are concerned; but we believe they meet the social needs of these older retired Club members.

The ten outings for 1983 included visits to Ricketts Point, the Nunawading Horticultural Centre, Zoological Gardens, Bay

Road Reserve Heathlands (Sandringham), Monash Campus, a day on Puffing Billy, and guided tours of the Melbourne Town Hall, Melbourne Concert Hall and National Gallery, and the Botanical Gardens. On a visit to the State Manuscript Library we were shown precious books, etc., prepared by the very early ornithologists in Australia and Victoria, including some of Mrs John Gould's original paintings.

Attendances varied from 24 to 8 (on a very bad day) — mostly 21 or 22.

Betty Gillespie
Acting Secretary

FNCV — Geology Group Annual Report for 1983

The year 1983 should be called the year of changes. A touch of sadness, coupled with expanded vistas hopefully signals new and exciting years ahead for the group.

The sadness, but fortunately not a total loss is the farewell from active office status of our long-time Secretary Tom Sault.

Tom has been a tower of strength to me and I take this opportunity to formally thank him on behalf of the group, and myself, for a job well done.

Our new Secretary is a young, active member of the Museum Staff — Helen Bartoszewicz. We wish her well.

An innovation half-way through the year was to advertise group meetings in the "Age" Weekender. As has been reported previously, our group in particular benefited directly, by an 8.8% increase in group monthly attendance.

1983 was definitely the year of the Planet Earth, with topics covering: Stresses of/in; Its Magnetic Fields; Its Heat, cause and effect; Earth profiles beneath the Oceans; and Its disaster zones. The group also looked at Soil (Where and What), and followed the discussions with an excursion covering various "soil" localities west of Melbourne (as far afield as Gisborne).

Finally, the Geology Group was invited to join the N.E. FNC on an excursion to Wabonga State Park (and Paradise Falls). While we had inclement weather, the FNCV Geology group and the N.E. FNC further cemented a close relationship with a return excursion, to the falls, organized for 1984, and discussions regarding further inter-group involvement.

Graeme Love
Chairman.

Conservation Co-ordinator's Report 1983/84

The Victorian Alps were focus of most of the FNCV's conservation efforts in 1983. Submissions and lobbying concentrated on the proposed Alpine Resorts Commission, the Land Conservation Council's Alpine Study Area, the Mt Stirling developments and the *Burramys parvus* versus ski-run clash at Mt Hotham. Most of these issues have now been resolved. Other areas of concern were logging within National Parks and the proposed amalgamation of the National Parks Service with the Forests Commission and Department of Crown Lands.

Issues which are likely to concern us in the next few months include the Victorian Railways scheme to sell off disused railway lines; plans to quarry marble in the proposed Cobberas-Tingaringy National Park; and commenting on the management of the proposed Marine Parks around Wilsons Promontory.

Malcolm Turner
Conservation Co-ordinator.

FNCV Botany Group Report 1983/84

The average attendance at meetings was 28, with some new faces appearing and unfortunately some also leaving. Regular monthly meetings were held during which lectures were given by guest speakers and on some occasions by members. A few of these talks were: 'The Errinundra Plateau', by John Blyth of the Museum of Victoria, 'Pollination of Acacias' by Miss Josephine Kenrick, 'Tundra' by Mary Doery and 'Kangaroo Island' by Mrs Ilma Dunn.

Much useful botanical information was also given in the Beginners Talks prepared by various members, which are presented at most meetings.

A new segment was introduced during this year, 'Flower of the Month' being a short talk by a member on a flower that may be seen at that time.

At the end of each month an excursion was held, often fitting in with the talk given at the previous meeting. These were held to such places as — Courtney's Road, Belgrave to look at bushfire regeneration, Starling's Gap for regeneration and general botany, Upper Thompson Valley to study berries. The Group started the year with Peter Carwardine in the Chair, and currently is under the leadership of Bill Rocke.

Peter Carwardine

Report of the Mammal Survey Group — FNCV 1983/1984

The past year has seen a continued high level of activity from the Mammal Survey Group with excursions to opposite ends of the State and many areas in-between, representing a wide range of habitat-types surveyed.

It proved to be a good year for 'batting', with members gaining valuable experience in the handling and identification of many of Victoria's bat species. Evidence of this included the capture (first time for the group) of the usually high-flying White-striped Mastiff bat *(Tadarida australis)* on trip lines across water, and, in a survey of Wyperfield National Park the recording of several new bat species for the Park's list.

The Group continued its ongoing forays into the Big River region, once again recording the rare and restricted Smoky mouse *(Pseudomys fumeus)*. Other excursions to little known and/or conservation-sensitive areas included East Gippsland, the Alpine region, and a short 'batting' survey of the Long Forest flora reserve at Melton. Financial assistance was supplied by the Ministry for Conservation for the East Gippsland Survey. Several members also participated in Leadbeater's Possum stag-watches that were part of a study financed by the World Wildlife Fund.

Topics for general meetings also reflected the Groups keen interest in matters concerning wildlife conservation. The ever-present question of the effect of forestry practices on the environment was the focus for several meetings including general group discussions and a speaker from the Forest Commission. The equally emotive subject of the 'harvesting' of Australia's faunal emblem was the topic for a particularly interesting and well-attended meeting. As well there were a large number of speakers who addressed themselves to the ecologies of a varied range of Victoria's mammals, and some outlined techniques for their study.

Attendances at meetings were moderate to good, and there was interest shown in the Group by an increasing number of newcomers.

13th May, 1984

Lance Williams,
Hon. Secretary

As the name "fossil" implies from the Latin *fodere* to dig (*fossilis* dug out), more than 60 persons from Melbourne, Alexandra and Kinglake Clubs came armed with geological hammers, chisels of all shapes and sizes, several pick axes and knives to Yea, where under the leadership of Mr Graeme Love they attacked the Siluro-Devonian rocks along a newly formed quarry beside the Limestone and later the Highlands Roads.

Almost immediately, a small child from Benalla discovered a magnificent curving specimen of *Baragwanathia* more than 20 cm long. This thallophyte of *c.* 400 million years B.P. is regarded as a lycophyte, and is one of the oldest vascular plants known in the world, although since its Australian discovery 50 years ago other old land plants have been found in Canada, Siberia and Greenland. Several other smaller specimens 10-12 cm long of this interesting marine plant were found and many other fossilized plant stems and leaves kept Graeme Love busy trying to identify them. Almost all the enthusiastic hunters found *Orthoceras*, a kind of squid, one of the Paleozoic cephalopods, as well as a few tapering-coiled similar forms about 5-6 cm.

Neil Lade found a vertical rock face about 30-40 cm long with wavy ribbony leaves which at first looked like a small eel, this could have been a Zosterophyll. This specimen was photographed, but could not be removed because of the friable nature of the rock.

Lunch was eaten in bright sunlight by the roadside of what was once a Silurian tidal estuary with sandy banks and silty channels.

This was no April foolery, everyone having a sense of awe at the realism of these ancient finds. En route to Yea, Graeme had supplied each excursionist with a structural map of the Silurian and Lower Devonian sediments of Central Victoria and pointed out the 15 or so non-fertile larva flows near Yan Yean, where there is a gold-mine. We made a brief stop near the site of Tommy's Hut since erased from the maps, as Tommy supplied illicit liquor to travellers. Hume Vale was originally named Scrubby Creek, but renamed in honour of Hamilton Hume. There were extensive views on both sides of the road in the Yea Gap and here we were told the Gap presents a difficult aviation hazard for small aircraft.

We also learned that it took two weeks for a Marjorie McGillivray and her family to travel in 1857 from Kinglake to Yea, a journey which we accomplished in about half an hour.

Yea is a dry climate, being in a rain shadow between the Strathbogie massif and the Healesville-Marysville acid volcanic igneous complex.

Some of the *Eucalyptus camaldulensis* (River Red Gum) along the Goulburn River seemed to be dying. We wondered if this was the long-term result of the 1982-83 drought, as recent rains had improved the pasture of the region.

Elizabeth K. Turner

GROUP MEETINGS

FNCV members are invited to attend any Group Meeting

Day Group — Third Thursday

Thursday, 21st June. Oakleigh Technical School Horticultural School. Meet at 11.30 a.m. Details of buses and times from Leader: I. Gillespie 578 1879.

Thursday, 19th July. World Trade Centre and Collins Street West. Meet at north-west corner of Spencer Street bridge at 11.15 a.m. Tour of Centre starts at 11.30 a.m. Leader: D. McInnes 211 2427.

Thursday, 16th August. South Melbourne Historical Buildings. Meet 11.30 a.m. at corner of Clarendon and Park Sts., South Melbourne. Leader: J. Zirkler 568 8337.

At the National Herbarium, Birdwood Avenue, South Yarra at 8.00 p.m.

Botany Group — Second Thursday

Thursday, 14th June. Member's night.

Thursday, 12th July. Fungi. Bruce Fuhrer.

Thursday, 9th August. French Island. Alan Chandler.

Geology Group — First Wednesday

Wednesday, 4th July. Historical geology. Paddy Duane.

Wednesday, 1st August. Shale oil. George Mapstone.

Mammal Survey Group — First Tuesday

Tuesday, 3rd July. Mammals of the Old World — Malcolm Turner.

Tuesday, 7th August. A Sugar Glider story — Stephen Henry.

Microscopy Group — Third Wednesday

Wednesday, 18th July. Stains. John Dawes.

Wednesday, 15th August. To be confirmed. Ross Murray.

Advertisements

Council has decided that appropriate advertisements are to be run in *The Victorian Naturalist*. This measure will help meet some of the production costs of the magazine and serve to minimise subscription rates. No more than four to five pages will be alloted for advertisements. Preferred fields include the following: Photographic supplies, Bushwalking gear, Travel, Travel goods, Technical equipment (Microscopes etc), Vehicles, Seminars/Conference in Natural History.

The editorial committee would be pleased to hear from any member who may work for or patronise any firms who could be interested in placing advertisements in the magazine. Please contact the committee via the National Museum, Russell Street, Melbourne with any suggestions on potential advertisers.

Archives

During research into the history of *The Victorian Naturalist*, and the Club generally, some gaps in our records came to light, and although it is unlikely that the early ones can now be filled, we hope that it will not be impossible for the later years.

Does any former Council member possess copies of the Minutes for the following years? If so, the Club would be very pleased to receive them.

May 1887-July 1901
November 1907-March 1913
June 1919-December 1930
October 1954-December 1960
1967-1968
January 1970-January 1975.

The Minutes for meetings between January 1931 and September 1937 have sustained some damage, so we would be grateful for copies covering this period also.

Please address them to the Secretary, c/- FNCV, National Herbarium, Birdwood Avenue, South Yarra, 3141.

Field Naturalists Club of Victoria

Established 1880

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OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 13th August, 8.00 p.m.

Charles Meredith. Wyperfeld National Park.

Honorary membership will be awarded to Mr. T. K. Slatter.

Monday, 10th September, 8.00 p.m.

Groups Discussion. "Fire Regeneration".

Monday, 8th October, 8.00 p.m.

Geoff Wescott. "Crabs".

New Members — July/August General Meetings

Metropolitan

Raymond Brereton, 20 O'Grady St., Carlton Nth
I. Eddie, 40 202 The Avenue, Parkville
Dawn Morrison, 11 Hilton St., Mt. Waverley
Mark Paholski, 20 Knowles St., Northcote
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Michael Seytort, 21 Barrington Ave., Kew

Joint

Frank and Betty Denton, 22 Dale Ave., Eltham Nth

Affiliated Club

Mt. Martha F.N.C

FNCV EXCURSIONS

Sunday, 2nd September. Coolart. The coach will leave Batman Avenue at 9.30 a.m. Fare $9.00, and there is also an entrance fee to Coolart. Bring a picnic lunch and binoculars if you have them. A lot of work has been done to the property since our last visit and the new entrance is off Lord Somers Rd

Saturday, 15th to Friday, 28th September. N.S.W., staying overnight at Deniliquin. West Wyalong, Gilgandra (3 nights here to allow for visits to the Warrumbungles), Narrabri (2 nights), visiting Kaputar National Park, Tamworth, Singleton, Katoomba (2 nights), Canberra, Albury and Melbourne. The cost of this 14 day excursion based on 25 participants and current prices is $665 — this covers coach travel and D.B.B. accommodation. A deposit of $50.00 should be paid on booking and the balance by 7th August. Bookings should be made through the excursion secretary Miss M. Allender, 19 Hawthorn Avenue, Caulfield North, 3161. The coach will leave Flinders St., outside the Gas and Fuel Building at 8.00 a.m. Bring a picnic lunch.

Saturday — Sunday, 6-7th October. V.F.N.C.A. Spring weekend. This will be hosted by Ringwood F.N.C. and the programme is as follows. Saturday afternoon is to be spent at Domeney Reserve, Park Orchards, looking particularly at orchids and led by Mr. Bouchier. This will be followed by an evening meeting in the reserve hall, starting at 7.00 p.m. with a brief business session, then slides and social get-together. Reserve is on Melway map 35, E9, and members should meet at Ringwood end of reserve at 1.30 p.m. Members going by public transport can be met at Ringwood Station at 1.00 p.m. Please let Marie Allender know if you will require transport or can supply it. It would be greatly appreciated if car owners with spare seats could offer a lift to members living near them. Bring a picnic tea for Saturday, tea and coffee will be available. The arrangements in the last Naturalist had to be changed as extensions are being built on the church.

On Sunday there will be a coach from Melbourne leaving Batman Avenue at 9.00 a.m. for Jumping Creek Reserve by 10.00 a.m. Fare $8.00, bring a picnic lunch. A walk from Antonio Park to Yarran Dheran is planned for the afternoon. Please join in as much as possible this weekend and help welcome members from country clubs. If anyone wishes to stay overnight at Ringwood please let Marie know — it is too near Melbourne for most of our members but a few might like accommodation. Crystal Brook Caravan Park is not far away, phone (03) 84 4367 for anyone wishing to camp.

Saturday — Sunday, 13th-14th October. F.N.C.V. Nature Show at National Herbarium.

Friday 18th — Friday 25th January, Cann River.

GROUP EXCURSIONS

All FNCV members, and visitors, are invited to attend Group Excursions

Botany Group

Saturday, 25th August. French Island.
Saturday, 22nd September. Courtney Road
Saturday, 27th October. Riddel, Orchids.

Mammal Survey Group

September 8th-9th. Rushworth.
October 6th-7th. Strathbogie Ranges. NOTE CHANGE OF DATE.
November 3rd -6th. Big Desert Wilderness

GROUP MEETINGS

FNCV members, and visitors, are invited to attend any Group Meeting

Day Group — Third Thursday.

Thursday, 16th August. South Melbourne Historical Buildings. Meet 11.30 a.m. at corner of Clarendon and Park Sts., South Melbourne. Leader J. Zirkler 568 8337.

Thursday, 20th September. Bellbird Dell Reserve bushland. Leader: Margaret Potter 29 2779.

Thursday, 18th October. La Trobe University, Tour of the Grounds. Leader J. A. Blackburn 379 8960

(Continued inside back cover)

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Cover Illustration: This photograph appeared in *The Victorian Naturalist* of 1921, (Vol. 38). It shows Aboriginal fire-stones at Aviation School. For more on the archaeology of Melbourne, see page 170

Marine Mammals of the Coastal Waters of the Illawarra Region

By N. H. Robinson*

Introduction

There is a paucity of published information on some species of marine mammals around the Australian coastline and it is hoped that this article will stimulate naturalists to record stranded species as well as those positively identified close inshore. Watson (1981) listed 76 species of cetaceans in the seas of the world. Fourteen have been recorded along the stretch of little more than 100 air km, about nine per cent of the N.S.W. coastline, between Port Hacking and just north of Jervis Bay, the sea edge included in the area surveyed for terrestrial mammals by the author (to be published). Further species will no doubt be recorded in the future.

Between 1965 and 1983 a number of stranded whales were not examined by me as they were pushed back to sea or washed in before I heard of them. There have probably been some strandings of cetaceans and some landings of pinnipeds that have never come to my notice.

The species listed below have been recorded since European occupation of Australia. Bowdler (1969) has recorded bones of the elephant seal, *Mirounga leonina* (Linnaeus) from a prehistoric Aboriginal site at Bass Point, Shellharbour.

If an animal is sighted at sea or stranded on shore, it is suggested that readers refer to *Sea Guide to Whales of the World* by Lyall Watson (1981) pages 280-282 for detailed lists of information that should be recorded and for addresses to which the information should be sent.

* 159 Gipps Road,
Keiraville, 2500, N.S.W.

The author has examined relevant material at the C.S.I.R.O. Division of Wildlife and Rangelands Research and the Australian Museum. The reference codes are CM and M or S respectively.

Order Cetacea (whales and dolphins)

FAMILY BALAENIDAE

Southern Right Whale *Balaena glacialis australis* Desmoulins

This rare species has been recorded on a number of occasions close inshore near Wollongong.

On 11 October 1978 a mother and calf swam past Wollongong. A mother and calf were recorded by the author from 5 August 1979 to 4 September 1979 between Thirroul and Kiama.

On 17 September 1979 a lone southern right whale appeared off South Beach, Wollongong. I believe it was a different animal to the female just mentioned (Robinson, 1979).

On 29 August 1980 a mother and calf swam southwards past Wollongong and were recorded off East's Beach, Kiama on 30 August 1980. They were last seen swimming slowly southwards near Gerroa (pers. comm., Brian Clarke).

On 11 and 12 August 1981 an individual was filmed near East's Beach, Kiama and an individual possibly the same one, was recorded off Austinmer on 17 August 1981.

A female and calf were filmed by Television W.I.N.4 off Coledale Beach on 19 September 1983.

REFERENCE MATERIAL:

Photograph, Illawarra Mercury 12 October 1978
Video, W.I.N.4 T.V. 11 August 1981.
Video, W.I.N.4 T.V. 19 September 1983

FAMILY BALAENOPTERIDAE

Humpback Whale *Magaptera novaeangliae* (Borowski)

On 17 July 1959 a specimen was washed ashore near where the Port Kembla coal loader is today. The author photographed the specimen on the beach. On 21 July 1959 the whale was buried in the sand.

Two adults were seen passing Stanwell Park on 15 July 1979 by Mr Bruce Robinson (pers. comm.) while he was hang gliding above them. Sketches done by him and another hang glider immediately on landing clearly showed them to be of this species, as judged by size and general appearance, including very long flippers.

On 3 July 1984 a pod of eight were filmed by T.V. Channel 10 as they swam past Port Hacking — Cronulla Beach.

When humpback whales occurred in large numbers prior to their decimation by whaling they were sighted regularly migrating past New Zealand and Australia with some sightings as far north as the north coast of New Guinea (Dawbin, 1966). As the humpback and the very rare southern right whale are the only two large whales that usually swim close inshore along the south eastern coastline of Australia (Dawbin, 1978) the large whales regularly seen passing by Wollongong until perhaps 20-25 years ago were probably of this species.

On their northern migration humpback whales reach the southern and middle regions of the N.S.W. coast from May to August. They disperse to calve and mate in the waters of the Great Barrier Reef. The southward migration occurs along the east coast during September to November. Regular observations from 1978 to 1982 suggest that the previously heavily depleted population that migrated along the eastern Australian coast is continuing to show slow signs of recovery (Patterson, 1983).

REFERENCE MATERIAL:

Personal photographs of 1959 specimen.

Video, Channel 10 T.V. 3 July 1984.

FAMILY ZIPHIIDAE

All beaked whales so far recorded on the Illawarra coast have been *Mesoplodon* species. The behaviour of members of this genus and in a number of cases, their appearance, in the wild, is almost unknown. All beaked whales have two shallow grooves on the throat that converge anteriorly and give the appearance of an incomplete letter "V", while the tail flukes have no notch in the centre, or in certain species, only a slight notch. In *Mesoplodon,* only males have functional teeth which consist of a single pair in the lower jaw. In adult females the teeth rarely appear above the gum.

Fig. 1 *Mesoplodon bowdoini* male, Corrimal Beach, 21 April 1978.

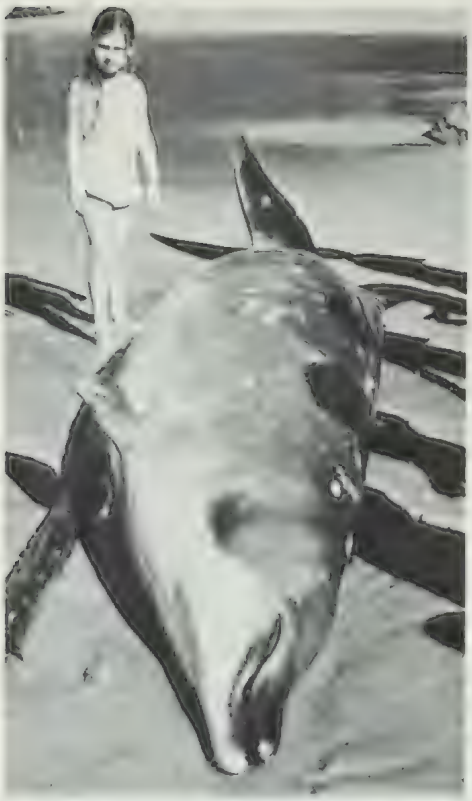

Fig. 2 *Mesoplodon densirostris* female, Stanwell Park Beach, 5 May 1980.

Identification can be quite difficult. For example Figure 1 shows the head of a male *M.bowdoini* and Figure 2 shows a female *M.densirostris* from Stanwell Park. The heads appear similar except for the male's visible teeth.

Gray's Beaked Whale *Mesoplodon grayi* Von Haast

On 27 February 1976 a male was stranded at Warilla Beach and was photographed by the author who collected the skull. No measurements were recorded as the incoming tide washed the body into the surf as the head was being taken.

This specimen had a single pair of rather large teeth 14cm from the tip of the beak. Rows of tiny non-functional teeth were showing in the top jaws, pointing outwards.

Strandings are widespread and in Australia are recorded from South Australia (Hale, 1939), Tasmania (Guiler, 1969) and Victoria (Brazenor, 1933).

REFERENCE MATERIAL:

C.M. 16211 ♂ Skull — Warilla Beach 27 February 1976.

Andrews Beaked Whale *Mesoplodon bowdoini* Andrews

On 21 April 1978 a male was stranded on Corrimal Beach and buried by Wollongong Council workmen. The author exhumed the head on 30 April 1978. A single pair of massive teeth were visible about midway in the lower jaws, 20cm from the tip of the beak (Figure 1).

The beak was white from the teeth to the tip in both jaws while the remainder of the body was dark.

About mid-December 1977 a female of this species was seen on Port Kembla-Windang Beach but the author first heard about it after a storm had partially uncovered the remains in January, 1978. The specimen was 4.1 metres in length with the unexposed section being in an advanced state of decomposition. No teeth were visible in the lower jaw. A single pair of elongated teeth were present in the mandibles, 18cm from the tip but had not erupted. These specimens are apparently the seventh and eighth strandings recorded for Australia.

Australian strandings are from Western Australia (Glauert, 1957), Tasmania (Guiler, 1967), Victoria (Dixon, 1970) and New South Wales (Tidemann, 1980).

REFERENCE MATERIAL:

C.M. 16212♂ Skull — Corrimal Beach.

Photograph, Illawarra Mercury, 22 April 1978.

C.M. 16213♀ Skull — Port Kembla, Windang Beach.

Dense Beaked Whale *Mesoplodon densirostris* (De Blainville)

Also known as Blainville's Beaked Whale.

On 5 May 1980 a female was stranded on Stanwell Park Beach and buried by Wollongong Council workmen. A resident who observed the stranding, reported that a number of animals were swimming close inshore when a large wave washed one ashore.

The upper half of this specimen was dark, sloping to about the vent while the remainder was light to white in colour. Some dozens of circular shaped indentations were scattered over the body and in particular along the belly. (Figure 2).

On 14 May 1980 the author exhumed the head. The teeth had not erupted and were 29cm from the top of the beak. Moore (1958) believes the species prefers tropical or sub-tropical seas.

Strandings are widespread but there have been few in Australia. One was recorded from Queensland (Longman, 1926) and another from Tasmania (Guiler, 1966). Krefft (1870) recorded a specimen from Lord Howe Island.

REFERENCE MATERIAL:

C.M. 16214♀ Skull — Stanwell Park Beach.

Photograph, Illawarra Mercury, 6 May 1980

Straptooth Beaked Whale *Mesoplodon layardii* (Gray)

A skull of this species was recovered from a mangrove swamp at Abraham's Bosom on the coast near Nowra during the last century and is lodged in the Australian Museum, Sydney. No date was recorded on the specimen but Dixon (1980) gave a date as approximately 1872.

Males of this species have a pair of very long teeth in the mandible measuring up to 35cm in length, tilting outwards then upwards.

Strandings have occurred mostly in New Zealand, but also in South Africa and Falkland Islands (Gaskin, 1972). Twenty-eight Australian strandings were reviewed by Dixon (1980) and included two from Western Australia, thirteen from South Australia, five from Tasmania, three from Victoria, four from New South Wales and one from Queensland.

REFERENCE MATERIAL:

M. 360 Skull — Nowra, Abraham's Bosom 1872.

FAMILY PHYSETERIDAE

Sperm Whale *Physeter macrocephalus* Linnaeus

A skeleton of this species is displayed in the gallery of the Australian Museum, Sydney. It was stranded at North Beach, Wollongong in 1918.

Gaskin (1972) stated that the species avoids shallow water in New Zealand unless sick. Best (1969) found that the 550m contour limited the shallow water penetration off South Africa. Gaskin (1972) also stated that very few catches were made close to the eastern Australian coast during last century and never featured in catches from eastern Australian whaling stations.

It is unlikely that this species will be seen off Wollongong unless sick. Strandings have occurred in many parts of the world.

REFERENCE MATERIAL:

Skeleton exhibited A.M. 325.

Pigmy Sperm Whale *Kogia breviceps* (De Blainville)

On 7 October 1968 an individual stranded itself on Wollongong Beach where it was filmed by W.I.N.4 T.V. It

was pushed back into the sea and was not seen again.

On 25 February 1975 a specimen was stranded at Garie Beach, Royal National Park and taken to Taronga Park Zoo where it died.

On 11 March 1979 a female 1.8m long persistently stranded itself at North Beach, Wollongong where it died. The author obtained the skull.

On 20 February 1984 a specimen was stranded at Garie Beach (Dawbin, pers. comm.).

Most frequent strandings elsewhere are from South Africa, New Zealand and south eastern United States.

In Australia, strandings have occurred in Western Australia (Hale, 1963), South Australia (Hale, 1939; Aitken, 1971), Tasmania (Lord and Scott, 1924; Pearson, 1936), New South Wales (Wall, 1851; Dawbin, 1978), Queensland (Longman, 1926; Hale, 1963), Victoria (Warneke, 1983).

REFERENCE MATERIAL:

Film, W.I.N.4 T.V. 7 October 1968.

C.M. 16210♀ Skull — North Beach, Wollongong, 11 March 1979.

FAMILY GLOBICEPHALIDAE

Longfin Pilot Whale *Globicephala melaena* (Traill)

A specimen approximately 4m in length was stranded on Thirroul Beach on 19 February 1969 and taken to a local council garbage dump where the author obtained the head. The head was given to Mr B. J. Marlow, then curator of mammals at the Australian Museum, and is currently in the possession of Dr W. Dawbin, research associate of that museum. Strandings commonly occur in south eastern Australia (Dawbin, 1978; Warneke, 1983).

REFERENCE MATERIAL:

Collection of W. Dawbin —WD36 — Thirroul Beach.

Killer Whale *Orcinus orca* (Linnaeus)

No strandings are recorded from the coast of the Illawarra. The late A. J. Robinson stated (pers. comm.) that prior to the 1920s he had seen killer whales on a number of occasions just north of Bass Point, Shellharbour.

A former Port Kembla harbourmaster, Captain Christie, stated (pers. comm.) that one had entered Port Kembla harbour in 1949 or 1950. Killer whales were seen until about 1958 by Mr W. Burn of Helensburgh, a regular amateur fisherman, who observed (pers. comm.) them on a number of occasions during the 1950s when he was fishing with his brother off Royal National Park. He stated that killer whales would breach and land on the back of the large whales attacked by them. Most sightings were in October.

False Killer Whale *Pseudorca crassidens* (Owen)

In October 1929 a specimen was stranded on Bulli Beach. It was exhumed on 18 February 1931 and lodged in the Australian Museum (Anon., 1931).

Strandings are widespread in the world, at times in large schools. Records of Australian strandings are from South Australia (Aitken, 1971), Victoria (Wakefield, 1967), Tasmania (Guiler, 1978) and Queensland (Longman, 1926).

REFERENCE MATERIAL:

S1874 — Skull and skeleton, Bulli Beach.

FAMILY DELPHINIDAE

Striped Dolphin *Stenella coeruleoalba* (Meyen)

Also called Blue-white Dolphin.

On 18 February 1983 a female beached itself at Towradgi and despite two attempts to put it out to sea, it

turned and beached itself again. After spending the night in Towradgi swimming pool, it was taken out to sea for perhaps 400m, and released by the Wollongong surf rescue boat. About 2 hours later it beached itself at Corrimal Beach and was obviously dying. The head was taken by the author after the animal was painlessly killed.

This species is wide-spread in tropical and warm temperate waters. The average length is 2.4m and this specimen was estimated at less than 2m. Colouration in this species is extremely variable (Watson, 1981). This specimen was bluish grey above and white below.

REFERENCE MATERIAL:

C.M. 16215 ♀ Skull — Towradgi Beach.

Common Dolphin *Delphinus delphis* Linnaeus

No stranded example of this species has been seen by the author but as it is common in coastal waters of N.S.W., it is probably only a matter of time before a stranding occurs on the Illawarra coast. A dolphin of this description was reported to me about two months after a stranding at Bellambi on one occasion and the author has seen this species while fishing close inshore on a number of occasions in past years.

This species is usually seen in schools of from about twenty to several hundred (Watson, 1981). The back is very dark above and lighter grey below with distinctive but variable flank markings which usually include a yellow to pale fawn patch. The average body length is 2.1m.

Numerous strandings have occurred in south eastern Australia (Warneke, 1983).

Bottlenose Dolphin *Tursiops truncatus* (Montagu)

On 12 August 1974 a bottlenose dolphin was accidentally drowned in a shark net about 200m from Coledale Beach. The author obtained the head.

This species is common in N.S.W. waters and is often seen cruising close inshore to the coastline of the Illawarra. It averages 3m in length and is usually medium grey above and lighter below.

REFERENCE MATERIAL:

C.M. 10215 sex unknown — Skull, Coledale Beach.

Order Sirena (dugongs, manatees and sea cows)

FAMILY DUGONGIDAE

Dugong *Dugong dugon* (Muller)

On 12 February 1959 an adult male dugong was washed onto a sandbank at Port Hacking and died. A number of photographs and measurements were taken of it the next day (Anon., 1959). The mammal had been seen in the vicinity for some days beforehand.

In December, 1960 a dugong was found dead at Port Kembla. Unfortunately the author did not hear about it until January, 1961. The description given by witnesses could fit only this species and the author has no doubt about the authenticity of the report.

REFERENCE MATERIAL:

Photographs and measurements obtained by Australian Museum (Anon., 1959).

Order Pinnipedia (seals)

FAMILY OTARIIDAE

Australian Fur Seal *Arctocephalus pusillus doriferus* Wood Jones

On 6 July 1969 an immature fur seal came ashore at Corrimal Beach in an emaciated condition. It was blind in one eye. When a veterinarian examined the animal it was discovered that it had a cancerous growth behind the eye. The

animal was killed and an autopsy confirmed the presence of the cancer. Troughton (1941) makes reference to an early, pre 1941 record of a four foot fur seal some thirty miles up the Shoalhaven River at its junction with the Kangaroo River, about eight miles from Bundanoon.

The largest number of fur seal records of any year on the Illawarra coastline during my years of interest was in 1969. All landings known to me have been between July and October. They have been on sandy beaches as well as on rocky headlands. Table 1 summarizes my records.

The author has had reports of several landings on the Five Islands off Port Kembla between 1946 and the late 1950s. Several reports were given of landings earlier this century and one in the late 1950s at Bass Point, Shellharbour.

REFERENCE MATERIAL:

C.M. 2975 — Skin and skull, Corrimal Beach.

FAMILY PHOCIDAE

Leopard Seal *Hydrurga leptonyx* (Blainville)

Table 2 summarizes my records.

Troughton (1941) mentions the capture of a ten foot specimen in the Shoalhaven River in 1859 with a full-grown platypus in its stomach, thus showing that the seal had travelled some distance up-river into fresh water. A specimen was taken in 1926 at Wollongong.

On 7 August 1968 an individual was shot at Brighton Beach, Wollongong Harbour. After learning of the shooting, the author took the skin and skull.

This species visits the coast of the Illawarra periodically with gaps of up to six years without records of landings. All landings known to me have occurred between August and January inclusive with the earliest date the 2nd August, and always on sand.

Table 1. Australian Fur Seal records, Illawarra coastline

Date	Number	Location	Comment where appropriate
6.7.69	1	Corrimal Beach	Small, immature, blind in one eye.
26/27.7.69	1	Barrack Point	Very thin. On rock shelf.
27.7.69	At least 4	Shellharbour & Barrack Point	Group swam by close to the shoreline
28.7.69	1	Port Kembla Beach	
8.69 & 9.69	Small group of unknown number	Five Islands	Report: A Stein, Fisheries Inspector
5.10.71	1	Port Kembla	Rocks
23/25.10.73	1	Wollongong Beach	
13.7.80	1	Brighton Beach	Immature
30.7.80	1	Wombarra Beach	
4.9.83 until 3.10.83 at least	1	Minnamurra Headland	Large, severe gash near front flipper which appeared to be immobilized

It is a migrant visitor from the Southern Oceans. It is of interest that the periodicity of landings on the N.S.W. coast parallels that on Macquarie Island. At that locality numbers oscillate from a few to 100-200 every four or five years. The seals are present on Macquarie Island from late June to December (Rounsevell and Eberhard, 1980).

Australian landings are from Western Australia (Serventy, 1948), Victoria (Brazenor, 1950), Tasmania (Davis, 1963), New South Wales (Troughton, 1941) and South Australia (Wood Jones, 1925).

REFERENCE MATERIAL:

261 Shoalhaven, 1883

M.3800 Wollongong, 1926

C.M. 3863 — Skin and skull, Brighton Beach, Wollongong, 7 August, 1968

Crabeater Seal *Lobodon carcinophagus* (Hombron and Jacquinot)

On 11 July 1982 a crabeater seal was recorded at Dolan's Bay, Port Hacking. It was taken to Taronga Park Zoo.

It is the most common seal in Antarctica and although normally found only in the outer pack-ice, vagrants have been recorded on the Australian coastline from Victoria (Brazenor, 1950), Tasmania (Davies, 1963), and South Australia (Wood Jones, 1925).

Discussion

The majority of species recorded are typically inhabitants of temperate to cool temperate waters, some are of tropical or sub-tropical origin (dugong, *Stenella, M.densirostris*) while others are from Antarctic waters as migrants

Table 2. Leopard Seal records, Illawarra coastline

Date	Number	Location	Comment where appropriate
9.64	1	Five Islands	Sandy strip
8.66	1	Werri Beach	Photos given to author
7.8.68	1	Brighton Beach	Shot
2.11.68 to 9.11.68	1	Bellambi Beach	Appeared to have been shot but was recovering when last seen
6.9.74	1	Bellambi Beach	
1.9.75	1	North Beach, Wollongong	
11 to 14.9.75	1	Corrimal Beach	One eye missing. Emaciated condition.
4.1.76	1	Port Kembla-Windang Beach	
2.8.77	1	Killalea Beach, Minnamurra	
5/6.8.81	1	East's Beach, Kiama	
17.8.81	1	North Beach, Wollongong	
31.10.81-3.12.81	Appeared to be the same one	North Beach, Wollongong to at least Corrimal Beach	Sub-adult. Apparently in good condition. Regularly came ashore, late afternoon to early morning.
21/22.11.81	1	Windang Beach	

(*Balaena, Megaptera, Hydrurga*) or vagrants (*Lobodon*).

With the exception of the little known beaked whales, the temperate species of cetaceans recorded on this stretch of coast are those which feature in strandings elsewhere in south eastern Australia.

It should be noted that the male *M.bowdoini* is the only male recorded from the N.S.W. coast, the *M.densirostris* is the first recorded from N.S.W. and only the fourth Australian record, the *M.grayi* is apparently the first recorded from N.S.W. and the *S.coeuruleoalba* is apparently the first recorded stranding in Australia.

A moderately large non-breeding colony of Australian fur seals occurs at Montague Island, which is a focus for fur seal activity along the southern N.S.W. coast. It is probably the immediate source of fur seal landings in the author's study area, although some of these seals probably originate from colonies as far away as Seal Rocks, Victoria (Warneke, 1975).

Acknowledgements

The author wishes to thank the National Parks and Wildlife Service of N.S.W.; the City of Wollongong Council, in particular Mr Ken Baker; North Wollongong Surf Club; the N.S.W. Police Department; Phillip Robinson; the late A. J. Robinson; Mrs D. Robinson; my wife Carlene; Dr J. H. Calaby of the C.S.I.R.O. Division of Wildlife and Rangelands Research; Dr Graham Ross of the Port Elizabeth Museum, South Africa; the Australian Museum for permission to view their specimens; and the Illawarra Mercury for permission to use their photographs.

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Spiders as aids in capturing pollinators of orchids?

BY T. J. HAWKESWOOD*

On 18 Septemer 1979, during an examination of flowering plants in a vacant allotment opposite the Western Australian Department of Agriculture in South Perth the author noticed a small green and cream spider situated on a petal below the labellum of *Caladenia patersonii* R.Br. var. *longicauda* (Lindl.) Rogers (Orchidaceae). The spider had captured a medium-sized wasp. Examination of three other *C. patersonii* in the area revealed another spider had captured the same species of wasp on one of the orchids. Each wasp had been freshly killed and, in both cases, the spider was grasping the thorax of the insect with its chelicerae. The spiders were motionless (probably feeding or injecting venom) and did not move at the author's approach. It is probable that the wasps are pollinators of this orchid but pollinia were not attached to their bodies as the spiders probably attacked and killed the wasps before they had opportunity to contact the pollinia. Eight plants of *Caladenia flava* R.Br., the only other orchid species in the area, were also examined but none possessed spiders. No other insect visitors to the flowers of either *C. patersonii* or *C. flava* were observed during the times of observation.

Both wasps and one spider were collected for later identification. The spider was unable to be identified to specific level due to its immaturity but was a species of *Diaea*—possibly *D. multimaculata Rainbow* (Thomisidae: Araneida). The spider, a female, possessed a green cephalothorax and a large abdomen variously cream and pale brown in colour with a dark brown posterior V-shaped mark. The wasps also remain unidentified but may be a species of *Erione* (Tiphiidae: Hymenoptera). The Tiphiidae of Australia have not been revised, so any present identifications to either genus or species remains tentative.

Thomisid spiders are well known for their behaviour of waiting in ambush for

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prey at the centres of flowers or tips of leaves (e.g. Clyne, 1969; Hawkeswood, 1982; Main, 1976; Mascord, 1970). However, the importance of these spiders in capturing the pollinators or potential pollinators of orchids has not been emphasised or fully realised.

Morcombe (1968, p. 64) illustrated a spider (*Diaea* sp.) which had captured a hover fly (Syrphidae: Diptera) (unidentified) on an unidentified white-flowering orchid. He stated the spider's ambush "must have been sprung from the heart of the flower, for the small, black-ringed fly still carried a packet of pollen which had stuck to its back". Morcombe also claimed that the spider had a yellow abdomen which matched the colour, size and shape of the orchid's pollinia. This may well be the case, but thomisid spiders need not employ crypsis on orchids with large flowers, e.g. *Caladenia* and *Thelymitra,* since the structure of the orchid flowers provides a number of ambush sites readily accessible to the labellum and column where the pollinators visit. The spiders on *Caladenia patersonii* were not cryptically coloured yet were successful in securing prey.

Often long fruitless periods of observation by naturalists and others are needed to obtain pollinators of orchids. It may well be that such thomisid spiders may assist our studies by capturing orchid pollinators that otherwise may remain undetected or escape human capture. (Of course the spider needs to be located before it completely devours its prey or damages the pollinators beyond recognition!)

A further observation is noteworthy. *Diaea* spiders were only found on *C. patersonii* in the area (although it is probable that they also wait for prey on other plant species). A spider hiding on a single orchid flower would have a better opportunity for obtaining prey than if it utilized a blossom of a multi-flowered non-orchid species. This is feasible since the frequency of insect visitors specific to a particular orchid flower would be higher (unless of course, a multi-flowered plant attracted large numbers of different insect species). Thus there may be a selective advantage for thomisid spiders to ambush insects on orchid flowers.

Acknowledgement

I would like to thank Dr. B. Y. Main (Zoology Department, University of Western Australia, Nedlands) for examining and identifying the spider in October, 1979.

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Calorophus elongatus Labill. (Restionaceae) — a new record for the Australian mainland

BY SUSAN G. HARRIS*

Introduction

Until recently rope-rush *(Calorophus elongatus)* was considered to be endemic to Tasmania. It was therefore of great interest to discover the species on the Australian mainland in the Otways, Victoria.

Description

Calorophus elongatus forms a mass of wiry, tangled stems that climb through the undergrowth to a height of two metres or more. Stems are slender, much divided and pale green. Leaf-sheaths have a reflexed tip (Fig. 1).

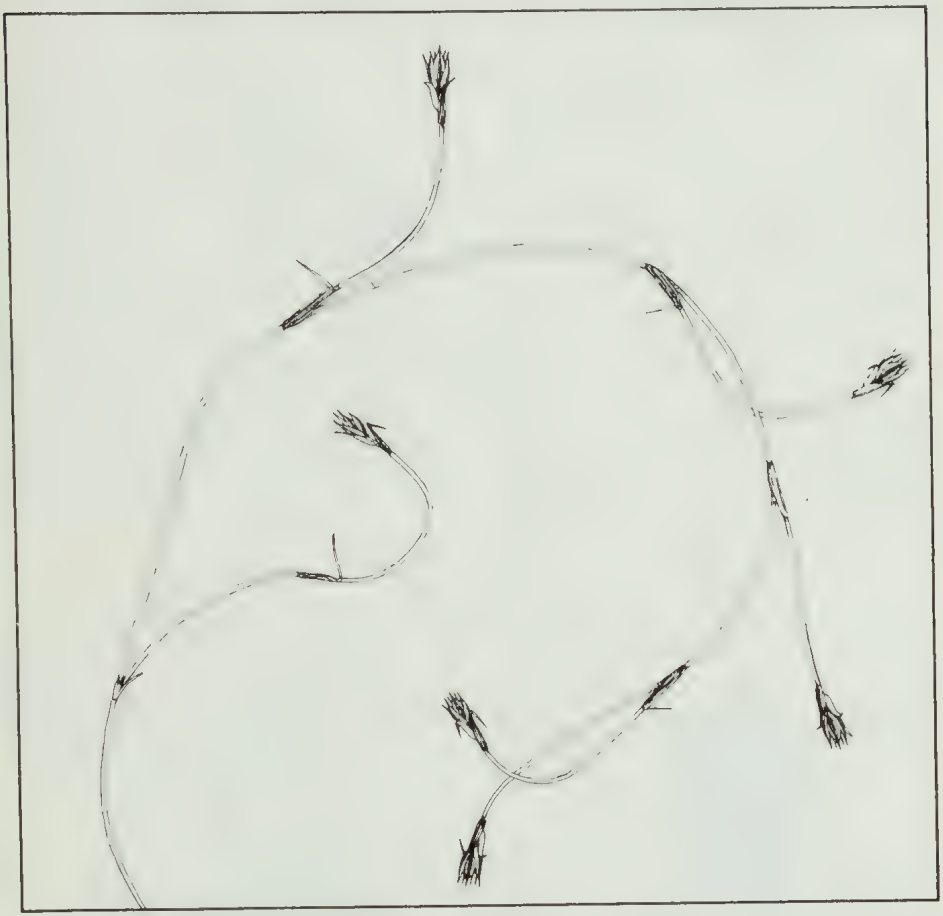

Fig. 1 *Calorophus elongatus* (Female) — showing habit and elongated pedicels of female spikelets.

*Forests Commission Victoria
Forrest, Vic. 3236

Fig. 2 L.H.S. *Calorophus elongatus* (Female spikelet x 12 — above, Fruit x 10 — below).
R.H.S. *Empodisma minus* (Female spikelet x 10 — above, Fruit x 10 — below).

Male spikelets are axillary, one-flowered, few together, sessile or pedicellate and 3-4 mm long. Male flowers are surrounded by 1-2 shortly awned glumes, shorter than the perianth. Both male and female flowers consist of 6 perianth segments with the inner 3 segments being longer than the outer. The segments are firm, brown and acute in male flowers and acuminate in female flowers.

Female spikelets are axillary, solitary, one-flowered, about 7 mm long and on very long pedicels up to 6 cm long (see Fig. 1). The two awned glumes are shorter than the perianth. Staminodes are present and there are 2 or 3 styles. Fruit is a one-seeded nut, dark brown to black, about 2.5 mm long with irregular longitudinal ridges.

Although *C. elongatus* is of similar habit and general appearance to the frequently occurring related species *Empodisma minus* (formerly *Calorophus lateriflorus*) it can be readily distinguished by the very long pedicels of the female spikelets and the striated nut. The female spikelets of *E. minus* are sessile with hyaline perianth segments, the nut is smooth and the sheathing and floral bracts usually have woolly hairs at the orifice (see Fig. 2).

Locality

C. elongatus has so far been found in three locations in the Western Otways:—

1) Gellibrand River approximately 4.5 km WSW of Carlisle River township. Grid K-33, 143° 20′ 36″ Long., 38° 34′ 36″ Lat. Collected 24.2.83.
2) Holywater Track. Grid K-42, 143° 28′ 15″ Long., 38° 43′ 30″ Lat. Collected 24.2.84.
3) Redwater Track. Grid K-42, 143° 30′ 30″ Long., 38° 43′ 15″ Lat. Collected 6.3.84.

Collections from these locations have been lodged at the National Herbarium of Victoria (MEL).

Habitat

Loc. 1) Closed-scrub dominated by *Leptospermum juniperinum* and *Melaleuca squarrosa* occurring on wet, peaty soils on the river flat of the Gellibrand River. The predominantly ferny understorey is composed of *Blechnum minus, Blechnum sp.* (King Island Blechnum), *Gleichenia microphylla* and wire grass *(Tetrarrhena juncea).*

Loc. 2 & 3) Closed-scrub communities similiar to location 1 and extending into the adjacent *Eucalyptus obliqua/E. baxteri* open forest. A small patch of *E. regnans* borders the Redwater track occurrence. Species common to both sites include *Leptospermum juniperinum, Melaleuca squarrosa, Bauera rubioides, Boronia muelleri, Gahnia sieberiana* and *Monotoca scoparia.* Poorly drained black sands have developed on Tertiary sediments in these areas.

Acknowledgements

I would like to thank Mr I. Roberts for preparation of the illustrations and Mr P. Barnett for field assistance.

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Project Pelican

The Bird Observers Club and the Gould League of Victoria are running a survey of the Australian Pelican. Information will be stored on the League's computer. Although they are such large, conspicuous birds, we don't know whether their numbers are declining, which water is important to them, if this varies according to the time of the year, or how far they fly. The survey will be held 4 times — for the months of October 1984, April 1985, October 1985 and April 1986. Forms can be obtained from the B.O.C.

Bush-peas of Victoria — Genus *Pultenaea* — 19

By M. G. Corrick*

***Pultenaea benthamii* F. Muell. in *Trans. Philos. Soc. Vict.* 1:38(1855).**

P. benthamii is a stiff shrub or small tree 1-3.5 m high. The stems are slightly ridged and pubescent when young.

The leaves are alternate, narrowly elliptic, 5-15 mm long and 1-3 mm wide with recurved margins and an acute apex tapering into a slender, pungent point. The upper surface is dark green and glabrous, the lower surface is paler with a prominent mid-rib and usually with pale, appressed hairs, at least on the youngest leaves.

The inflorescence is a tight cluster of 3-5 flowers at the tips of lateral shoots and is surrounded by deciduous, brown papery bracts.

The stipules are triangular, 1.5 mm long, dark brown and appressed to the stem.

The bracteoles are lanceolate, dark brown with a thin, irregular margin and scattered hairs down the centre which become denser towards the base. They are attached at the base of the calyx and extend to the apex of the lobes.

The calyx, including the short pedicel, is 6-7 mm long; it is densely covered with pale, appressed hairs. The lobes are acute and shorter than the tube.

The flowers have a deep yellow standard 11-12 mm long and 11-12 mm wide, with a few dark purple lines at the base. The keel is very deep purple and the wings are deep yellow with a few dark purple lines.

The ovary and base of the style are densely pubescent with pale, appressed hairs.

The pod is brown, covered with pale hairs and half enclosed by the calyx.

Flowering time is late September to late November.

P. benthamii is plentiful in the Grampians on the Serra, Mt. William and Victoria Ranges; it has not been recorded north of Halls Gap. There are isolated occurrences in East Gippsland and southern New South Wales near Eden, (see Fig. 31). In the Grampians it is one of the showiest and largest flowered species in the genus. Well grown plants are often completely covered in flowers.

SPECIMENS EXAMINED included: Grampians, Jimmy Creek, *A. C. Beauglehole 66983* (MEL 606598), 6.xii.1979; Howe Ranges, *A. C. Beauglehole 31635* (MEL 581412), 10.xi.1969; Bairnsdale, *T. S. Hart* (MEL 592386), x.1919; Grampians, Mt. Abrupt, *F. Mueller* (MEL 567123), 14.xi.1855 — type; Mt. Kaye, *J. H. Willis* (MEL 581411), 16.x.1948.

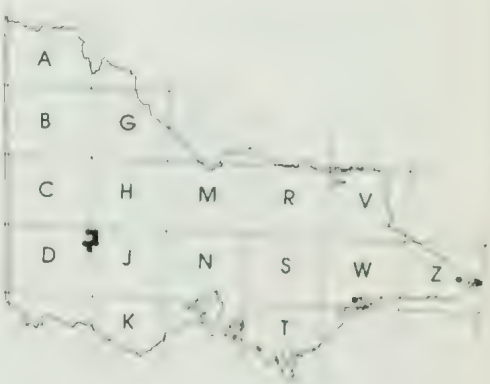

Fig. 31 Known distribution in Victoria of *Pultenaea benthamii*.

* 7 Glenluss Street, Balwyn, Victoria, 3103.

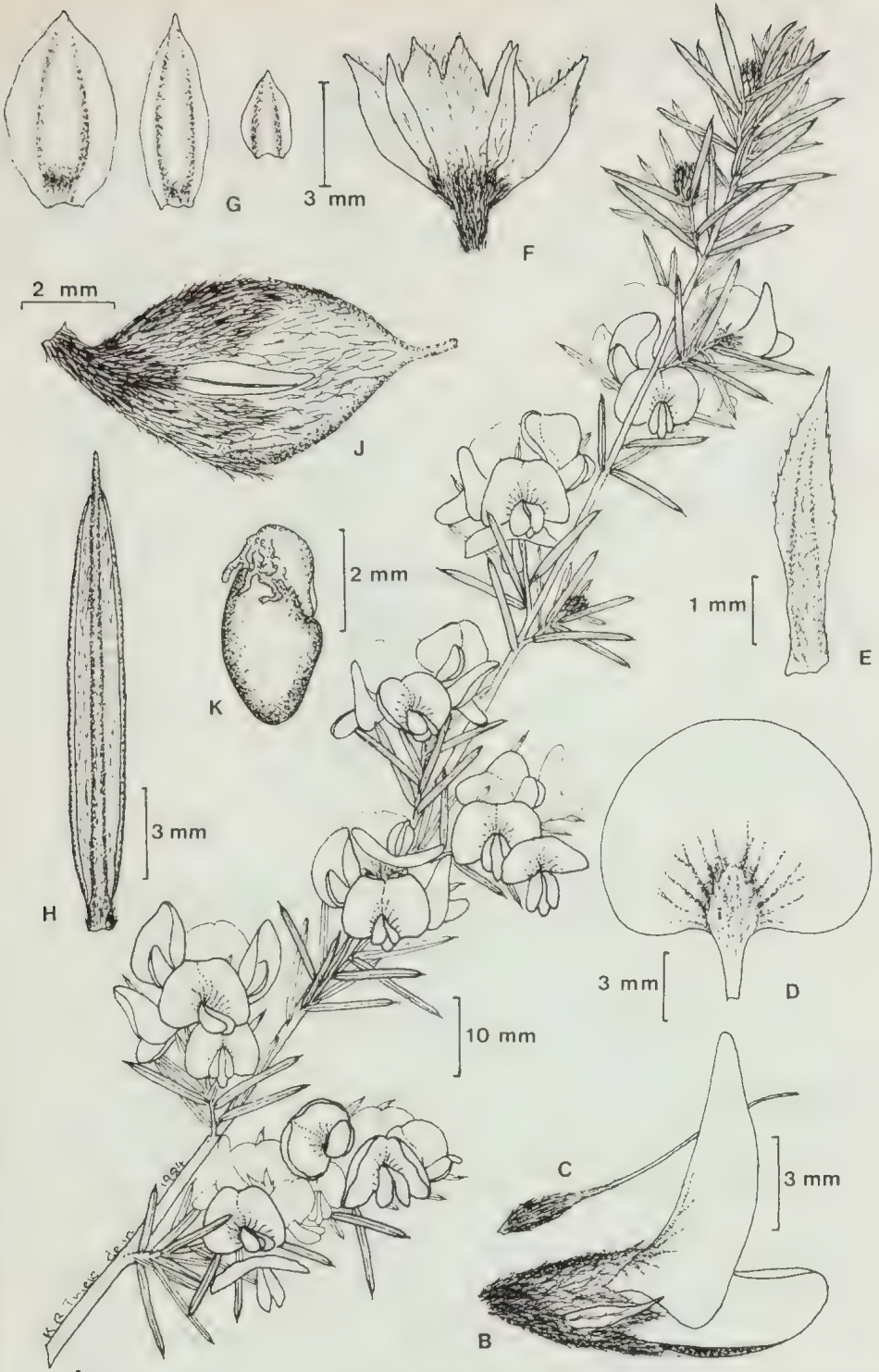

Fig. 30. *Pultenaea benthamii*. A, habit; B, flower, side view; C, ovary & style; D, standard; E, bracteole; F, calyx & bracteoles ; G, bracts; H, leaf, all from MEL 1504358; J, pod; K, seed. from MEL 606598.

Three Important Orchids

By A. C. Beauglehole†

The three orchids illustrated were discovered by the author between 1942 and 1971. All three are considered rare or endangered. Adequate precautions must be taken to control invasion of alien animal and plant species, within their respective ecosystems.

The following broad distribution according to Study Area, Sector, Minor Grid and Sub-Block Identification is provided (see various Study Area Reports for fuller details).

* = Non-A.C.B. records

A — Long-tongue Summer Greenhood (*Pterostylis aestiva* D. Jones)

ALSA	G V53;W8,9	28I,L	Cobberas NP
	H W17	31C	Snowy River NP
	i W15	34a	Nunniong-Timbarra State Forest (HP)
	i V53;W8	35e-g	Uncommitted areas (UN)
SGSA	*C I?	11?	Wilsons Promontory NP
EGSA	c W9	11b	Uncommitted area (UN)
	*c or e Z2	—	?

B — Gorae Leek-orchid (*Prasophyllum diversiflorum* Nicholls)

SWSA	c E12	—	Gorae West — 2 Private Properties (PP's)
	*f D49	—	Hotspur; Road & PP (Rd & PP)

C — Swamp Greenhood (*Pterostylis tenuissima* Nicholls)

SWSA	A E1,2	1A	Discovery Bay CP
	c E15	7b	Tyrendarra Coastal Reserve (CR)
	c E22	—	SW of Portland (PP)
	*c D47	—	SSE of Dartmoor (PP)
	*i D10	—	Salt Creek (PP)
COSA	c K21	—	Naringal (PP)
	*e K21,29,30,31	—	(PP's)
	H K40	24A	Serpentine Creek WR
SGSA	C T50	11C	Wilsons Promontory NP

† 3 Beverley Street, Portland, Victoria 3305.

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Fig 1. A Long-tongue Summer Greenhood *Pterostylis aestiva*
B Gorae Leek-orchid *Prasophyllum diversiflorum*
C Swamp Greenhood *Pterostylis tenuissima*
DRAWINGS by Collin Woolcock.

The Archaeology of Melbourne

By Gary Presland*

Interest in the Aboriginal history of the Melbourne area is long-standing as seen from the dates of some of the past issues of the *Victorian Naturalist* containing notes about finds of Aboriginal artefacts in the Metropolitan area (22:127 (1905); 23:183 (1906); 26:38 (1909); 38:37 (1921) 39:2 (1922) and many more). Over the years a large number of Aboriginal sites have been recorded and reported on by interested amateurs and professionals through the pages of this and other scientific journals (e.g. Spillane, 1971; Spillane, 1974; Brooks, 1960; Brunton, 1951; Brunton, 1956; Brunton, 1957; Casey, 1956; Burston, 1954) but until recently there had been no detailed studies of the archaeology of this part of Victoria.

Between June 1982 and July 1983 an archaeological survey of the Melbourne metropolitan area was carried out under the supervision of the Victoria Archaeological Survey (now a part of the Ministry for Planning and the Environment).

The survey was carried out on a twelve month contract basis, funded by the Australian Heritage Commission with facilities provided by the Victoria Archaeological Survey.

The study was a preliminary one to assess the possibility and need for a more detailed study of the archaeology of the area. As part of the first phase of the study, a search of the relevant literature was undertaken to gain an appreciation of the previous work done in the area. Studies of the sort reported here often rest on the work of interested members of the general public.

The area of the study was basically that of the Melbourne and Metropolitan Board Planning Scheme with the exception of the shires of Melton, Werribee, Bulla and Whittlesea. In extent the Study Area was approximately 3740 square kilometres and stretched in a north-south direction from Broadmeadows to Frankston, and from Deer Park in the west to Lilydale in the east (see Fig. 1). Within this area, for the purpose of the study, five broad landscape units were defined and a representative sample of each was surveyed on foot. The results of this work are detailed below following a brief indication of the types of Aboriginal archaeological sites found within the Melbourne metropolitan area.

Site types

Five types of Aboriginal sites have been recorded within the Melbourne area. Each of these sites is the material evidence of some aspect of Aboriginal lifestyle in the Port Phillip region prior to European settlement and collectively they provide the main clues in any reconstruction of that lifestyle. Prior to this study, there were about 120 archaeological sites recorded in the Study Area, mostly as a result of past amateur involvement. This total includes the following types of site.

1. Surface stone tool scatters. This is probably the most common type of Aboriginal site within the Study Area, having been reported in almost every part of the metropolitan area. Mitchell (1949) records a number of such sites around the Port Phillip region including Point Cook and Altona. In most of these sites regularly formed tool types such as backed blades and small scraping tools called 'thumb-nail scrapers' make up one component of the assemblage. Such formal tools are generally taken as an indication of use of the site within the last 5000 years. Waste flakes, created in the process

* Victoria Archaeological Survey, 29-31 Victoria Avenue, Albert Park, Vic. 3206.

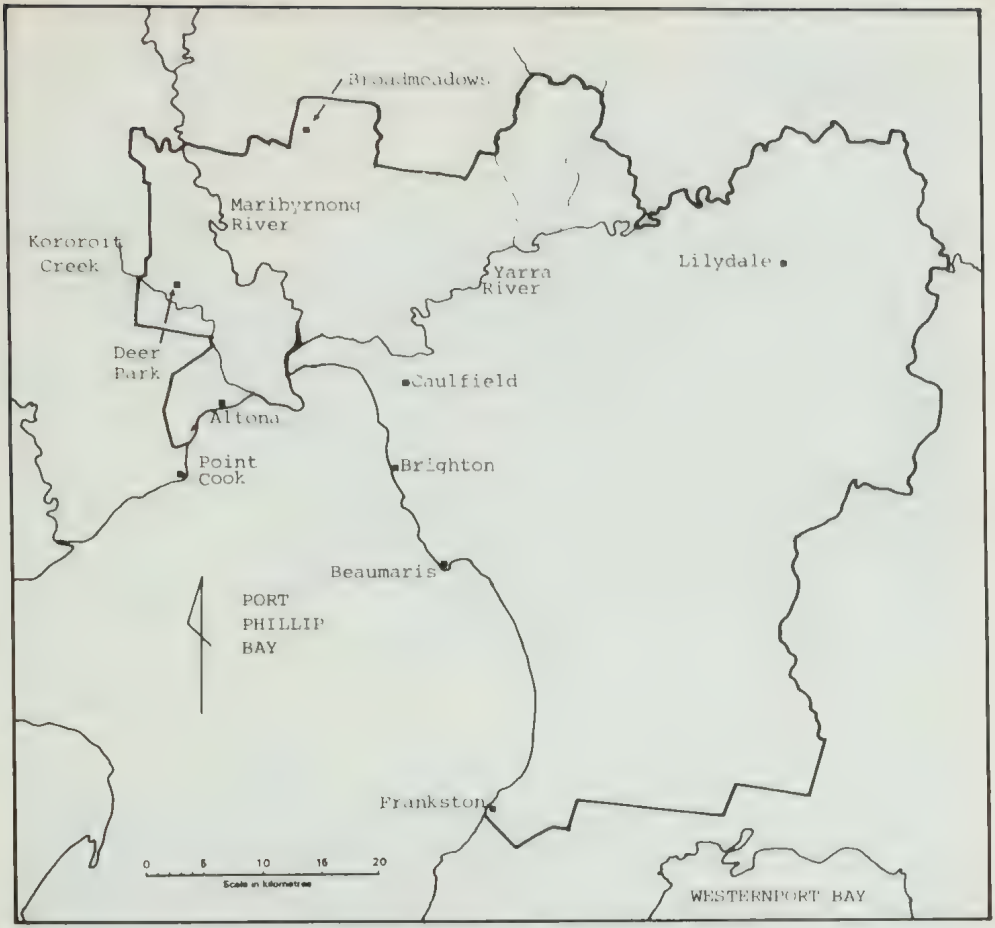

Fig. 1. Map of Study Area, showing localities mentioned in text.

of making stone tools, commonly make up the vast majority of stone pieces found in these sites.

2. Scarred trees. Another commonly found site type in the metropolitan area, such sites probably were once more frequent — prior to the large scale clearance of timber in the area. These sites are referred to often as 'Canoe trees' (eg. Glance, 1949; Massola, 1969) but in fact not all scars are sufficiently large to indicate such a use. Bark was removed also for the construction of shields, containers or for provision of shelter. Well known examples of this site type are in the Fitzroy Gardens (see Fig. 2) and the Melbourne Zoo.

3. Shell middens. Along the shore of Port Phillip Bay at a number of places are the accumulated waste of Aboriginal campsites where meals of shellfish were consumed. Such sites were more commonly found prior to the development of large stretches of the foreshore for recreational purposes but examples can be found still at Brighton and along the coast in the southern reaches of the Mornington Peninsula (see Fig. 3). Study of these sites gives an insight into the diet of Aboriginal groups in this area.

4. Rock wells. A number of sources of freshwater, thought to have been used by Aborigines in pre-European times have been located along the shore of Port

Fig. 2. Aboriginal scarred tree in Fitzroy Gardens. Bark from this tree may have been used for a shield or for part of a shelter.

Phillip Bay, between Beaumaris and Black Rock (see Fig. 4). These sites were the subject of articles by Massola (1959) and Brooks (1960) both published in the pages of this journal, but never well documented. Two of seven reported sites were located during the present study and, because of their nature and the rarity of the type, are seen as particularly important within this area.

5. Isolated artefacts. This type of site consists of the findspot of an individual Aboriginal implement, usually a stone hatchet head, discovered commonly on the ground surface. Many such artefacts have been found in the Melbourne area usually during clearing operations or at a low depth during excavation for foundations, etc. In addition to edge-ground hatchet heads, portable grinding stones — mortars and pestles — and hammerstones have been found (see Fig. 5). The informational value of these isolated artefacts is extremely limited but they continue to turn up, possibly because they are recognised easily as Aboriginal artefacts.

Fig. 3. Shell midden on the Mornington Peninsula. This type of site is the most common in the Port Phillip region.

Fig. 4. Rock well. This hole in the sandstone at Beaumaris was a source of freshwater as a tap to the local water table.

Fig. 5. Aboriginal stone tools of the type often found as isolated artefacts. Artefacts such as these mullers and anvil have been found in many places within the metropolitan area.

All photos by courtesy of the Victoria Archaeological Survey.

At the time of European settlement of the Port Phillip area local Aborigines were making and using a wide range of artefacts of perishable material, and engaging in a number of activities at particular types of sites. Few of these artefacts and none of the sites have survived the rapid and extensive development which has taken place in the Melbourne region. Fortunately, however, there are written records in the form of descriptions and, in some cases, drawings of some of these devices which add immeasurably to our appreciation of the diversity of Aboriginal economic strategies in this area. Fish traps and weirs and a variety of devices for capturing game are mentioned in the ethnohistorical sources. These artefacts are discussed in greater detail below.

The site types listed above do not occur equally throughout the Study Area. Clearly, particular types may be restricted to particular physiographic zones. Shell middens for instance are found generally within a short distance of the shoreline; the occurrence of scarred trees is more likely in areas that are wooded now or were previously so. Within the Study Area, most of the recorded scarred trees are in close vicinity of a major stream or an area that was swampy prior to reclamation activities within the past 149 years. Although there are reports of freshwater shell middens on some of the streams in the Melbourne area, none of these have been recorded in the recent past and the only middens now extant are along the margins of Port Phillip Bay. The majority of stone tool scatters have been recorded close to permanent sources of fresh water, for instance near the Maribyrnong and Yarra Rivers and the Kororoit Creek.

Aborigines of the Melbourne area

Any account of the Aborigines in the Melbourne area relies heavily on sources other than the archaeological evidence. In particular, ethnohistoric sources, consisting of observations on the Aborigines recorded in diaries, journals, letters, newspapers and books, have been of tremendous help in this research. The most useful sources of information on the indigenous population of the Port Phillip area are the papers — both official and private — resulting from the Aboriginal Protectorate, in operation for ten years from 1839. The field notes and journals of Chief Protector George Augustus Robinson and William Thomas, his Assistant for the Western Port area, have been especially valuable in this regard.

The following brief account of the pre-European Aborigines of the Melbourne area draws heavily on these sources as well as archaeological evidence of the type indicated above.

There were two Aboriginal tribes who claimed as their territory parts of what is now the Melbourne metropolitan area. All of the Mornington Peninsula, extending as far north as Mordialloc Creek, but including a strip around the top of Port Phillip to the Werribee River, was the territory of the **Bunurong** who numbered about 85 at the time of European settlement. All the area drained by the Yarra River and its tributories was the territory of the **Woiwurung**. A census taken by the Assistant Protectors in 1839 counted 124 members of this tribe.

These numbers are probably lower than normal and should not be regarded as an indication of the usual size of a tribe in prehistoric Victoria. A more correct figure would be of the order of 500. A number of factors were at play in this area which led to a reduction in numbers of Aborigines observed. For approximately 30 years prior to European settlement on the Yarra, whalers and sealers were active around the Bass Strait and Western Port Bay areas. This would have had an effect on the **Bunurong** at least, either through direct contact with the Europeans or through the introduction of diseases to which they had no natural immunity. Moreover, there is some evidence of a high number of deaths within that tribe during the previous 30 years because of

fighting with a neighbouring Gippsland tribe. Other short term factors need to be considered also. People might have been away from the camp on the day the census was taken, thus giving an incorrect picture of the population. Certainly, larger numbers than these were seen in the Melbourne area in the early years of the settlement. At a celebration to mark the arrival of George Robinson, given in Melbourne in March 1839, there were estimated to be 600 Aborigines present.

The **Woiwurung** and **Bunurong** lived as hunter/gatherers, exploiting the seasonally available resources of the region. Although each recognised a particular area as their own, there was a fair amount of coming and going between areas by members of the different tribes. On several occasions Thomas travelled with various groups of **Bunurong** to a number of favorite localities such as swamps in the Caulfield area and on the Yarra River near Bulleen. On these travels the **Bunurong** moved in groups ranging in size up to about 35 people. The frequency of movement was determined largely by the seasonal availability of food and fresh water (Thomas, 1840-44).

The **Woiwurung** were divided into four smaller groups each of which was identified with the clearly defined tract of land within which they lived. One of these groups, called **Kurnaje-Berreing** was situated on the eastern side of the Maribyrnong, extending north to take in the stone quarry at Mount William (Casey, 1971). The **Wurundjeri** lived along the Yarra and in the area to the south; the **Boi-Berrit** to the west of the Maribyrnong; and a second branch of **Kurnaje-Berreing** north of the Yarra taking in the courses of the Plenty River and Darebin Creek (Howitt, 1904).

These local groups or bands operated for the most part as independent economic units but they were closely linked to each other by social ties. Marriage partners were generally obtained from outside the group, so that there were direct family connections between different bands. Moreover, ceremonial clan affiliations linked a number of people from different bands. Members of these local groups came together at regular intervals therefore, to take part in ceremonial activities. It was possible also, by exercising one's familial rights, to share in the resources of other group at times of scarcity or abundance. This was a social means of ensuring that all members of the tribe could survive during hard times.

It is thought that the **Woiwurung** and **Bunurong** were two parts of a larger 'nation' consisting of five tribes around the Port Phillip area. The other tribes were the **Kurung** or Barrabool from the region of Geelong, the **Wathaurang** from the Bellarine Peninsula and further west, and the **Taungurong** or Goulburn River tribe (see Fig. 6). These five tribes made up the **Kulin** nation (Howitt 1904:70-75). Members of each of these tribes were seen in the Melbourne settlement on numerous occasions, having come for a variety of purposes. In the time before European settlement the area adjacent to the Yarra River, which now is the central business district and where the first buildings were erected, was the meeting place for the assembled tribes of the **Kulin** nation.

Within the Port Phillip area, movement by the **Woiwurung** was determined to some extent by the location of seasonally available resources. There were thus perhaps three or four major movements per year but it is difficult to reconstruct such trips with any precision. During the warmer months it is likely that groups lived along the major streams, fishing, hunting and snaring game such as wallaby, 'bush turkey' and wildfowl, and collecting the abundant plant foods, such as the Yam Daisy *(Microseris scapigera)* known as murnong. Fishing was carried out by a number of strategies, including spearing from canoes and the use of weirs. A device of this kind was noted by the Grimes exploratory party on the Maribyrnong River in 1803 (Fleming, 1972). Using

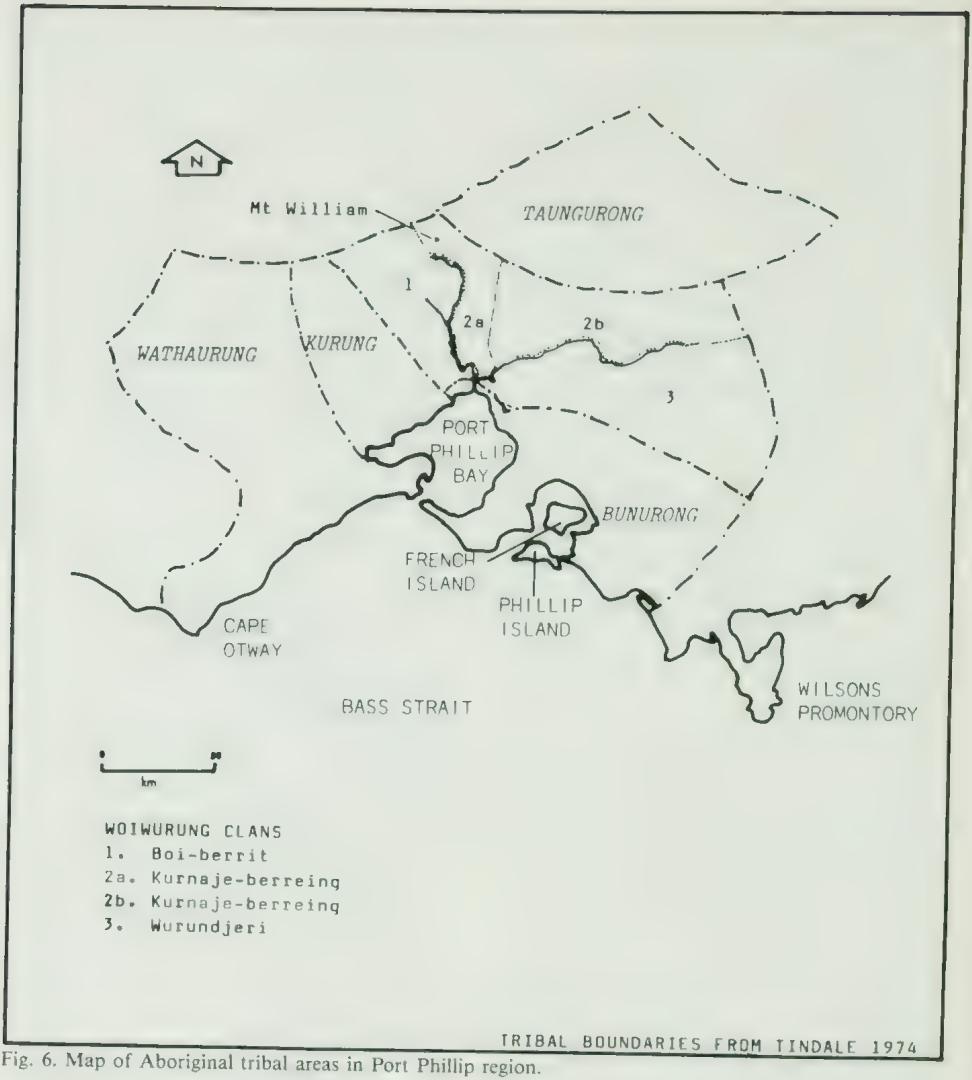

Fig. 6. Map of Aboriginal tribal areas in Port Phillip region.

a natural barrier in the form of rock rapids, the Aborigines had constructed what was probably a brush fishtrap which enabled them to take fish with ease. Similar devices are known from the Western Port Bay area and the Western District (Robinson, 30 April, 1841). No traces of the Maribyrnong fishtrap now remain; such devices were an early casualty of European settlement.

Large birds and wallabies were sometimes trapped using a portable hide for camouflage and a noose at the end of a stick, which was dropped over the head of the prey. Artefacts of this kind were described by early observers in the Melbourne area but unfortunately there are no known examples today.

Eeling was an economic activity of great importance to the Aborigines of the Port Phillip area. Large groups were seen on a regular basis at a number of locations within what is now the metropolitan area. Particularly favoured spots were Le Mans swamp in present day Caulfield, the

Botanic Gardens area, and a swamp called Bolin, near the Yarra River possibly in Bulleen. So abundant were eels in this last locality that a large group of Aborigines could spend a month of each year at the spot. March and April was the time when eeling was especially favoured.

During the colder months of the year it is likely that Aboriginal groups sought the shelter of the higher parts of their territory. Within the Dandenongs for instance they exploited the forested areas for wombat, kangaroo, possum and smaller mammals, as well as a variety of plant foods such as the pith of treeferns and bracken. In addition to providing meat, possums and kangaroos were a source of materials for clothing and other artefacts. Possum-skin cloaks were made by stitching together with kangaroo sinew a number of stretched and dried skins using a bone needle. Lyrebirds were caught also, particularly in the period after European settlement when their tails were prized by the settlers.

Conclusion

The Aboriginal way of life in the Port Phillip region was severely disrupted and ultimately destroyed by the European settlement and subsequent importation of large numbers of sheep and cattle. Access to previously important places was denied or made impossible, traditional resources were destroyed and, most telling of all, European diseases and habits proved too strong for the original inhabitants. The last full-blood **Bunurong,** Jimmy Dunbar, died in April 1876; the last full-blood **Woiwurung,** William Barak, in August 1903.

The evidence of this way of life, which had lasted with a multitude of changes and adaptations for about 40,000 years, can be found in all parts of the Melbourne area. It consists of prehistoric archaeological sites of the kind detailed above and which are part of the cultural heritage of this region. These sites are valuable for that reason alone but also because they are irreplaceable. Further study may record more sites and increase our knowledge of the prehistory of this part of Victoria but it cannot put back those scarred trees, stone tool scatters, and middens which have been destroyed in the past 149 years. What we know of the pre-European Aborigines of Port Phillip is based on the incomplete record which has survived to this day. That knowledge is certainly increasing as more evidence comes to light but we still have a lot to learn.

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Freshwater Invertebrates

By Ralph Miller. Gould League of Victoria. 1983. $5.00

It is perhaps unfortunate for the author that this, the first of a proposed series of illustrated keys to Victorian invertebrates, should have been on a group for which an excellent popular text already exists. Comparison of *Freshwater Invertebrates* with W. D. Williams' *Australian Freshwater Life* is inevitable. Williams' much more thorough treatment is a must for any tertiary student of freshwater studies or anyone working in the field. It may however be slightly daunting for younger students, in primary and lower secondary schools, and for people just developing an interest in the fauna of ponds and streams. It is for these people that *Freshwater Invertebrates* is likely to be a useful introduction.

The book is in horizontal A4 format, perhaps designed for classroom use, but rather unwieldy for use in the field. This is unfortunate in a series which could well have considerable use out-of-doors.

The format is, however, spacious and well laid out, with clear black and white drawings of whole animals to illustrate each point of the key. The key, mainly to order and selected families, is presented on every second page, with relevant text on the facing pages. In some cases ample space exists in which additional interesting information could have been included (for instance, extra details of the ecology or distribution of the identified groups). Two pages of colour plates, illustrating different forms of aquatic arthropods and four types of freshwater habitats, provide an attractive frontispiece and end page respectively.

Like most simplified keys, some caution is required in its use. The choice of groups included in the key seems somewhat arbitrary, and rather weighted towards the fauna of standing waters. Within the order Diptera, for instance, the relatively uncommon family Dixidae is included, while several distinctive families, at least equally common, are excluded. These include Blephariceridae (torrent midges) a family with considerable biogeographic significance, Syrphidae (rat-tailed maggots) of interest in water pollution studies, and the Empididae, a widespread family in Victorian streams. In fact, only 8 of the 19 families of Diptera recorded by Williams (almost all of which occur in Victoria) are included in the key. Several other widespread groups of noticeable and distinctive animals, such as Nematomorpha (horse-hair worms) and Megaloptera (alder flies) are also excluded. By contrast, the microscopic group Rotifera, are identified.

A few other minor problems could have been avoided by appraisal by an experienced aquatic entomologist. For instance, chironomids (non-biting midges) are described as having *"anal gills* on the second last abdominal segment". In fact, a relatively small number of chironomid species bear *blood gills* on the second last abdominal segment, and it is these which are illustrated, while all freshwater members of the family bear *anal gills* on the last body segment.

Despite the few shortcomings mentioned, *Freshwater Invertebrates* provides a key which is simple, easy to use and will work most of the time (especially for pond animals). At $5.00 it is a cheap and manageable starting point for the development of interest in this largely ignored but fascinating group.

— J. D. Blyth

Short Title — **Travels and Adventures in South Australia, 1836-1838**

By W. H. Leigh, Esq. (1839). (Hardcover facsimile edition, 1982, by Currawong Press, Milson's Point, N.S.W. 2061). $9.95.

This facsimile edition of a book published in 1839 concerns the voyages and travels of Dr. W. H. Leigh to, and in, South Australia during the years 1836-1838. Few people would have heard of Dr. Leigh and his work, since he died in the same year this book was published before he had an opportunity to write further material which would have given him wider acclaim. His name fails to appear in the *Australian Encyclopaedia* with other writer-naturalists despite this most valuable contribution to Australian literature.

The first six chapters (occupying about a quarter of the book) are dedicated to the trip from England to Kingscote (Kangaroo Island) in South Australia via the Cape of Good Hope and Tristan d'Acunha, a journey which in those days took 4 months, including a 3-week stay at the Cape. The following ten chapters concern general life at Kingscote and Adelaide, encounters and experiences with Aborigines, and brief accounts of the fauna and flora of Kangaroo Island. The final two chapters are devoted to an expedition to Sydney and Parramatta, New South Wales.

Much of the narrative is anecdotal, concerning people and their behaviour, but for the naturalist, there are many references to animals and plants. In chapter 2, there is mention of the jellyfish *Physalia atlanticus* and its stinging effects on human skin, observations on flying fish and details on shark catching. In chapter 5, Leigh provides notes on the cape swallow, *Hirundo capensis,* and a few records of bird migration, while in chapter 6, he records the capture of the albatross, *Diomedea exulans,* and observations on their flight behaviour. Leigh also reports on the rarity of the kangaroo and the apparent extinction of the emu on Kangaroo Island. It is incredible that the decline of wildlife was already evident in those early days. In chapter 9, Leigh provides what must be one of the first published observations on kangaroo biology and mentions the less tasteful subject of kangaroo-tail soup! A brief account of the island's snake and bird fauna is also provided, although at the time most had not been described by scientists and had no common name. One of the most interesting accounts is of the death of the botanist-collector, Richard Cunningham, who was murdered and eaten by Aborigines in 1835 in northern New South Wales.

The title page of the book states that it is "embellished" with numerous engravings, but there are only five illustrations listed, and in the facsimile edition, illustration no. 2 is omitted. However, the four illustrations included are well reproduced. The drawings are not signed but may have been illustrated by Leigh himself. They portray the South Australian Aborginal male as stout, muscular and prominently bearded.

Overall, I found this to be an easily read and most interesting account of life in the early days of the European-occupied Australia, of the Aborigines and their habits, and the animals and plants of Kangaroo Island. It is a great pity that W. H. Leigh did not live to produce similar accounts. Full credit is due to the publishers for reproducing what I regard as a poorly known but important historical document, which should be on the shelf of every genuine naturalist and those interested in Australian history.

— T. J. Hawkeswood

FIELD NATURALISTS CLUB OF VICTORIA

Reports of recent activities

General Meeting
Monday, 4th June

Honorary memberships were awarded to Eulalie Brewster and Mr and Mrs Savage, both on completion of 40 years membership. The awarding of a joint honorary membership is apparently a first for the Club.

Speaker for the evening was Dr. Fred Neumann, a research officer with the Forests Commission, who spoke on forest entomology, a subject he has been engaged in for the last 16 years. (Incidentally this field of study was initiated, in Victoria at least, in the 1960's with the onset of the Sirex wood wasp, which built up in very large numbers in the late 60's and early 70's).

Dr. Neumann outlined the four major objectives of forest entomology, viz.

— documentation of all insects that inhabit forests, and the study of their biology and ecology

— description and assessment of damage to tree structures, whole stands, and to forest products

— maintenance of insect pests at levels below those causing economic loss

— assessment of the impact of forest management and operational practices on the insect fauna.

The inherent potential of insects to become economic pests stems largely from their high degree of biological success which is due to a number of factors, including; successful adaptation to different environments, high reproductive capacity, a great capacity to utilize a large range of food sources, and a great ability to survive unfavourable periods (through aestivation, hibernation and diapause).

Some examples of typical ecology — management oriented surveys were given which looked at the effect of forestry practices on the *insect fauna*. In a study of the effect of conversion of a native forest to softwood it was found that there was a resulting decreased species diversity, whereas selective "utilization" of a mixed species eucalypt forest resulted in an increase in insect activity, at least partly due to a reduction in predation.

A number of slides were shown illustrating many of the species which are the focus of the forester's attention.

The remarkable ability of the stick insect to change colour was seen. This change can occur not only according to the insect's background colour, but also with the insect's population density, i.e. with increasing numbers they darken, thus becoming more obvious to predatory birds — an inbuilt population-regulating mechanism. They have a predominantly two-year life cycle and consequently there is an upsurge in numbers every two years. They feed on a range of eucalypts but particularly like *Eucalyptus regnans*. Females eat approximately twice as much as the male and continue to feed even when the male is copulating. They produce a pheromone that attracts males from miles around. Males are actually not necessary for reproduction but in such asexual reproduction only females are produced. The eggs drop to the forest floor where they lay for 18 months before hatching.

The Sirex wasp kills trees by introducing a fungus and toxic mucous during egg implantation which destroy the chlorophyll in the foliage. The female takes 15 to 20 minutes to drill into the wood with her ovipositor and she can carry up to 600 eggs. At the Forests Commission's research station at Sherbrooke biological controls are being cultivated such as other wasps which variously parasitize the eggs, larvae and pupae, and nematode worms which cause sterility in the wasp.

Other slides revealed a whole host of other "culprits" such as cup moth larvae, lerp insects, leaf hoppers, longicorn and scarab beetles.

Conservation: Malcolm Turner brought attention to Victorian Railways proposal to sell off 20 to 30 disused railway lines within the next three years. It was pointed out that the land immediately bordering old lines often includes the last remnants of vegetation of the surrounding area.

Exhibits and Nature Notes: Under microscopes were displayed rock sections and a large number of slides of gall wasps.

Amongst eggs of the skeletonizing caterpillar *Uraba lugens* (Family Nolidae) were some black ones, indicating that they had been parasitized.

Also exhibited was a German text on shells of the world. This volume is part of a major mollusc reference comprising approximately 50 volumes.

A blue fly from Montrose was subsequently identified as a hover fly. Finally, from East Metcalf came a selection of fungi including, *Lepiota gracilenta, Crepidolus subhaustellaris, Pycnoporus coccinaeus, Tremella mesenterica* and *Clitocybe paraditopa.*

It was reported that in Camberwell fly agaric was growing under birch trees from spores that were spread there two years ago.

General Meeting
9th July, 1984

A moments silence was observed in memory of Ethel Dixon, a member since 1945 who died in her 95th year.

Honorary membership was awarded to Percy Wyatt on completion of 40 years membership.

The Australian Natural History Medallion is to be awarded to Kevin Keneally of W.A. for his work in botany and for service to natural history groups.

Speaker for the evening was Malcolm Turner who presented "A naturalist ramble through Africa" via a 'three-screen spectacular' slide show. Malcolm travelled to central and eastern Africa spending most of his time in northern Tanzania where, amongst other things, he climbed Mount Kilimanjaro, a mountain which supports many habitat types including rainforest, heathland (not unlike our own) and, between two peaks of the mountain, desert. Above this there is permanent ice and show. On the lower slopes bananas, etc. are cultivated and Blue Gums and the Silky Oak are also grown for firewood. A hazard of the climb is altitude sickness — of the 20 people in Malcolm's group only three made it all the way to the top.

Another feature of geological and biological interest is the Ngorongoro Crater, a large caldera similar to Tower Hill but bigger and containing one large and several smaller saltwater lakes. In these lakes may be found Greater Flamingoes which strain small shrimps through their bill and the Hippopotamus, which spends most of the day in the water (to avoid sunburn and dessication) and comes out in the evening to graze. Although a vegetarian this is an animal to be extremely wary of due to its strong territorial imperative. Probably with this thought strongly in mind Malcolm's party once spent 24 hours bogged in a Hippopotamus wallow in Burundi. At night they could hear the 'Hippos' nearby!

Malcolm was amazed by the sheer numbers of individuals. Guinea Fowl, Wildebeest, Gazelles, Lions (very common as skins not valuable), Cape Waterbuffalo, Zebra, Plains Elephant (largest herbivore), and the Black Rhinoceros. The Rhinoceros is still being poached for its horn, which is prized as an aphrodisiac in Asia. Poachers have been known to use helicopters to escape detection. The Ngorongoro Crater is a conservation area (not a national park) which also serves to preserve the lifestyle of the Masai people who raise and tend their cattle within the confines of the crater. Olduvai Gorge, site of Louis Leakey's famous archaelogical discoveries is also located within the crater.

Within the Serengeti National Park Malcolm again encountered huge numbers of animals, especially Wildebeest, which gather in hundreds of

thousands on the plains for their migration to Kenya. The animals migrate because their various food items reach optimum in different areas at different times of the year — interestingly Zebras always lead the migration. The Serengeti plains are very flat except for a few granite outcrops among which lives the closest living relative of the elephant, the Rock Hyrax, an animal about the size of a large Guinea Pig!

In Rwanda Malcolm visited the Virunga volcanoes, seven volcanic mountains clothed in tropical jungle on the higher slopes. (The lower slopes are cleared for cultivation where, apart from subsistence farming, the pyrethrum daisy is grown as a cash crop). The clearing of habitat for crops along with poaching has led to the demise of the Mountain Gorilla whose total world population numbers 300 to 400 individuals. Small groups of people can be shown the gorillas in the wild through guides that are familiar to the gorillas and can communicate with them via a language of grunts and grumbles. Groups of Mountain Gorillas each contain a dominant male and usually a few mature females plus younger animals, although one group contained all males. Some can be quite cheeky. One young male spent some time gazing into Malcolm's eyes before making off with his day pack! Mal had to chase him to get it back. Wholly vegetarian, these gorillas live up to the age of 25.

Exhibits: Under microscopes were three plant sections illustrating various staining techniques, and also diatoms of the genus *Suribella*.

On display were the three Australian species of carrion and burying beetles (Family Silphidae).

The Australian Museum's Complete book of Australian Mammals, awarded to Dan McInnes and donated by him to the Club, was on show before being placed in the library. Another new book exhibited was one on the marine polychaetes of N.S.W.

From the Botany Group excursion to Fernshaw came some fungi specimens, viz. *Ascomycetes scutelaria, Campanella* sp. and *Grifola* sp.

Victorian Field Naturalists Clubs Association Meeting — held at Creswick 10 to 12 March, 1984

Twenty-one members from Melbourne and about forty members from twelve other Field Naturalists Clubs were welcomed at St. John's Hall, Napier St., Creswick by Mr Albert Perry, Vice President of the Creswick Field Naturalists Club.

At 1 p.m. Albert led an excursion to gold mines in the district. The first site visited was the shaft and mullock heap of the Australasian No. 2 mine, where in 1882 twenty-two miners lost their lives. The shaft in which they were working was flooded by water from the buried gold-bearing gravels (deep lead) which they had penetrated while exploring the location for a new eastern shaft. The last survivor of the disaster died in 1963 at the age of 101 years. At the site a forest nursery of conifers, pepper trees and grevilleas was subsequently established. Now a box-thorn hedge and a few pine trees are all that is left, but the area is a Nature Reserve.

From this site we travelled north to see the ruins of a brick pump-house at the Berry No. 1 mine. We then visited Broomfield, a tiny village now, where the greatest quantity of alluvial gold from any one mine in the world was taken. This was also the area in the district where gold was first discovered.

That evening, slides of historic photos of the working mines and long-lost townships were shown and supper was served by the Creswick Club.

On Sunday, 11 March Albert Perry led an excursion to the north-east of Creswick, first through Smokeytown and then on to Spring Mount where a fine stand of large White Sallees *(Eucalyptus pauciflora)* was growing. Misty rain was falling and this enabled the bus to travel along unsealed roads

(Continued from inside front cover)

At the National Herbarium, Birdwood Avenue, South Yarra at 8.00 p.m.

Botany Group — Second Thursday.
Thursday, 13th September — To be confirmed
Thursday, 11th October. "Heaths" — Hilary Weatherhead.

Geology Group — First Wednesday.
Wednesday, 5th September. Rock night – Practical workshop.
Wednesday, 3rd October. Australian Aboriginals from the Cape York Peninusula — Max Dean.

Mammal Survey Group — First Tuesday.
Tuesday, 4th September. Where have all the mammals gone? An historical look at the changes in mammal distribution in the Western District — Speaker Andrew Bennett.
Tuesday, 2nd October — Speaker Bob Warneke.

Microscopy Group — Third Wednesday.
Wednesday, 15th August. Dissection techniques — Ross Murray.
Wednesday, 19th September. Whole Mounts — Mr. Urwin Bates.
Wednesday, 17th October. Microscopy for laboratory technicians — Mr. Robert Graham.

without raising dust for the following convoy of cars.

The Newlyn Reservoir was the next stop and, to the delight of the photographers, numbers of dragon-fly nymphs were seen in all stages of emergence from their "mud-eye" chrysalis phase to the adult fly. May-fly larvae were caught by the trout fisherman of the party.

We lunched at Wombat Park, Daylesford, climbed the spiral staircase of the tower and admired and enormous size and variety of the exotic trees in the park.

Later at Franklinford, we stopped to inspect the memorial to Mr Stone Parker on the site where he established a church, school and buildings for the local Aborigines, many of whom are buried nearby. Later, the remainder were transferred to Coranderrk Aboriginal Station near Badger Creek, Healesville. At Franklinford, Yellow Box (*E. melliodora*) and Red Box (*E. polyanthemos*) replaced Candlebark (*E. rubida*) and peppermints (*E. radiata* and *E. dives)* which were growing around Daylesford.

Travelling south through Hepburn, we passed close to Mt. Kooroocheang, which is thought to be one of the most recent of the extinct volcanoes in the district and which is said by some local people to emit rumblings and dull explosive sounds known as 'Handy's Guns'. At the foot of this mountain we viewed the two-storied 'Smeaton House' which was built by Captain Hepburn in 1837 and is now undergoing restoration.

We drove through the township of Smeaton, across Birches Creek and visited Andersons' old bluestone flour mill built in 1862. The weather had cleared as we returned to Creswick and all enjoyed the warm sunny afternoon.

During the evening at St. John's Hall, reports from Clubs were given by the following representatives:

Marie Allender	F.N.C.V.
Mr Macdonald	Benalla
Albert Perry	Creswick
Beryl Rogan	Maryborough
Barry Harvey	Mid-Murray
Sue Beattie	Montmorency
Noel Hunt	Peninsula
Mr Humphries	Stawell

Monday, 12 March was a perfect autumn day starting with a light frost. The view from Brackenbury Hill was panoromic as the extensive pine plantations which had once covered the hill were now gone, following the bushfire that swept the area in 1977. The Forest Commission may replant the area.

We then walked down Sawpit Gully which is now a delightful valley shaded by pines and oaks and many arbutus trees. A visit was then made to the Creswick Forestry School (established in 1910) which incorporated Dr. Tremearne's house built in 1884. On the hill above this house is another school building, originally the Creswick Hospital built in 1862. As lectures were in progress we were unable to enter the buildings.

Lunch and farewells were partaken in the shade of eucalypts near St. Georges Lake, a beautiful body of water near the site of early gold diggings.

Mr Albert Perry and members of the Creswick Field Naturalists Club were applauded and thanked for hosting an informative and thoroughly enjoyable week-end. **— Elizabeth K. Turner**

Field Naturalists Club of Victoria

Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

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GENERAL MEETINGS

Monday, 8th October, 8.00 p.m.

Geoff Wescott. "Crabs".

Honorary membership will be awarded to Miss Catherine Palmer.

Monday, 12th November, 8.00 p.m.

Presentation of the Australian Natural History Medallion.

The Medallion address will be given by the winner, Kevin Kenneally, on "The Wongan Hills biological survey — a case study in the conservation of an area of W.A. wheatbelt vegetation as an example of the potential of co-ordinated amateurs in natural history data collecting".

Monday, 10th December, 8.00 p.m.

Extraordinary meeting. Motion: That the North-East Field Naturalists Club be elected as an affiliated club of the Field Naturalists Club of Victoria.

Paul Peake — "Owls".

Honorary membership will be awarded to Ken J. Simpendorfer.

New Members — September/October General Meetings

Metropolitan

James Allan, 51 Morrah Street, Parkville
Cecily Falkingham, 27 Chippewa Avenue, Mitcham
Mrs. P. Genery, 24 Ross Street, Toorak
Peter Hendley, 19 Threadneedle Street, Balwyn
Robert Monaghan, 9 Ivon Street, Bayswater North
John Read, 3 Barnie Road, Heathmont
Lesley White, 18 Currajong Avenue, Mt. Evelyn

Country

N. Robinson, 159 Gipps Road, Keiraville, N.S.W.
Lois Rooke, Post Office, Guys Hills
Maurice Schinkel, 3 Gordon Street, Korumburra, (conservation)
Greg Wallis, 19 Foam Street, Harbord, N.S.W., (arachnology, herpetology, fishes)

Joint

Ross Meggs & Cindy Hull, 2 Hume Street, Beaumaris.

FNCV EXCURSIONS

Saturday — Sunday, 6th-7th October. Victorian Field Naturalists Clubs Association Spring weekend get-together, hosted by Ringwood F.N.C. Come if you can, details in last Naturalist.

Sunday — 21st October. Kinglake Day. See article in this issue p. 222.

Saturday — Tuesday, 3rd-6th November. Camp out in Big Desert Wilderness. Details from Mammal Survey Group.

Sunday, 11th November. Stream life of the Acheron River. Leader: Ros St. Clair. The coach will leave Batman Avenue at 9.00 a.m. (note time). Fare $10. Bring a picnic lunch.

Saturday — Sunday, 1st-2nd December. Anglesea. This weekend is intended as a break-up function for the year and it is hoped members from all groups will attend. There will be a coach (fare $25) and some accommodation for the coach party is booked at the Debonair Motel — Guesthouse which will be in addition to the fare. Groups or members wishing to camp or use other accommodation may do so and there should be some seats on the coach available for campers. Tentative plans are for Saturday, afternoon excursion, possibly a BBQ tea and a spotlighting walk in the evening, and an excursion on Sunday. Members who require coach transport and/or accommodation at the Debonair should book with Marie Allender as soon as possible and include the coach fare.

Friday — Friday, 18th-25th January. Cann River. This excursion will include trips to Mallacoota, Tamboon Inlet, etc. Motel-Hotel accommodation and coach fare $350, and a deposit of $50 should accompany bookings with Marie Allender. Further details next Naturalist.

Saturday — Monday, 26th-28th January. Alpine camp out with John Milligan and Dr. Jim Willis. Details later.

GROUP EXCURSIONS

All FNCV members, and visitors, are invited to attend Group Excursions.

Botany Group.

Saturday, 27th October. Riddel, Orchids.
Saturday, 24th November. Mornington Peninsula

Mammal Survey Group.

November 3rd-6th. Big Desert Wilderness.

GROUP MEETINGS

FNCV members, and visitors, are invited to attend any Group Meeting.

Day Group — Third Thursday

Thursday, 18th October. Latrobe University Gardens and Wildlife Reserve. Meet at the University Bus Terminal 11.30 a.m. Bus 256 leaves at 10.30 a.m. from corner of Russell & Bourke Sts. Leader: Mr. A. Blackburn, 379 8960.

Thursday, 15th November. Cherry Lake, Altona. Birds of the area. Meet at Altona Station 11.30 a.m. Train leaves Flinders Street Station 10.46 a.m. Williamstown train change at Newport. Leader: Mrs E. Gillespie, 578 1879.

Next outing will be to Botanical Gardens, February 21st, 1985. Details in next issue.

(continued inside back cover).

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Editorial Committee: P. Lawson, D. McClellan, J. Phillips, R. Thomson, L. Williams

Cover Illustration: Wax-lip Orchid, *Glossodia major* R. Br. See paper on page 188

The Initial Effects of Fire on Orchids in a Stringybark-Box Forest

By J. M. Barnett*

Introduction

On 14 February, 1983 (two days before Ash Wednesday) a fire occurred on the eastern edge of Kinglake National Park near Steels Creek. The fire burnt 4 hectares of the park and abutting private land, passing within 30 metres of the author's house before being brought under control. Although conditions were hot and dry, the terrain steep and the area unburnt for 21 years, the fire did not crown; probably because the undergrowth was very sparse. The orchids on the ridge near the house had been closely observed for the previous five years and this paper describes the subsequent effects in the first year after the fire.

Vegetation

The dominant eucalypts are red stringybark, *Eucalyptus macrorhyncha* F. Muell. ex Benth., and long-leaf box, *E. goniocalyx* F. Muell. ex Miq., forming an open dry sclerophyll forest with an understorey of sparse and scattered wattles and peas (in nearby areas burnt within the last 8 years this understorey has become dense). The ground cover is predominantly tussock grass, *Poa australis spp. agg.* J. H. Willis. Thirty-six orchid species are found locally and 22 of these were found on the burnt ridge.

Soil

A heavy yellow clay subsoil is covered with a sparse grey-brown topsoil.

Methods

The effect of the fire on the orchid population was assessed by two means. Initially overall estimates were made for species on the burnt ridge, covering an area of approximately one hectare, both before the fire (using pre-fire knowledge) and again as each species came into flower after the fire. This method, whilst reasonably accurate for species occurring in small numbers and on well known sites, became more subjective and inaccurate for the most common species.

To overcome this problem 24 grid squares, each 5 × 5m, were pegged out, 12 in the burnt area and 12 in nearby unburnt areas with similar topography and orchid flora. Counts were made as each species came into flower and totals compared between the burnt and unburnt areas.

The more numerous and uniformly distributed species were measured more accurately by this second method, but the less common species tended not to be well represented in the squares and were best estimated by the first technique.

Results

Seventeen of the 22 species showed a decrease in flowering plants to 50 per cent or less when measured by either technique (Table 1) and 8 of these were reduced to below 10 per cent. In addition to the reduction in flowers, non-flowering plants (rosettes) of *Pterostylis nutans* R.Br. were reduced to below 10 per cent of pre-fire numbers. *P. longifolia* R.Br. was only seen as occasional scattered rosettes in areas where it had previously flowered regularly. In contrast, the less severely affected *P. parviflora* R.Br. produced approximately the same number of rosettes as in previous years.

Three species, *Glossodia major* R.Br., *Caladenia caerulea* R.Br. and *C. gracilis* R.Br., showed no marked change and only two species, *C. praecox* Nicholls and *Prasophyllum brevilabre* (Lindley) J. D. Hook, showed a definite increase in flowers in burnt areas. The response of the

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latter species was most dramatic, changing from the second rarest to one of the more commonly seen species. Several species appeared to flower in greater numbers for a few metres either side of the burnt area, especially *Glossodia major, Caladenia praecox and Prasophyllum brevilabre.*

Discussion

The predominant response of orchids to the fire at Steels Creek in the first year was a decrease in flowering. This contrasts with the response seen at Anglesea where the increased flowering of many species attracted a great number of visitors. Interestingly, 20 species were common to both areas, and yet 15 species that decreased at Steels Creek were either increased or unaffected at Anglesea (M. D. White, pers. comm.). The most dramatic difference between the two areas was seen in *Diuris maculata* Smith, strikingly increased at Anglesea and severely depressed at Steels Creek. However, both areas showed a common increase in spring flowering leek orchids *(Prasophyllum sp.),* and a decrease in some winter flowering greenhoods *(Pterostylis sp.);* this pattern was also seen in the more severely burnt areas at Belgrave (H. Weatherhead and I. Dunne, pers. comm.).

The most obvious difference between Anglesea and Steels Creek is the soil which generally has a high sand content at Anglesea, but is very heavy clay with no sand at Steels Creek. Compact clay soils conduct heat more slowly than sandy

Table 1. The Effects of Fire on Orchid Numbers at Steels Creek.

Species	Approximate numbers flowering on burnt ridge		Total numbers flowering in survey squares in 1983	
	Pre-fire '78-'82	Post-fire '83	Unburnt	Burnt
Caladenia caerulea	3000	3000	91	89
C. catanata	100	50	15	2
C. gracillus	2000	1000	15	14
C. praecox	5000	8000	125	215
C. irridescens	10	0	3	0
Calochilus paludosus	100	20	4	2
C. robertsonnii	100	40	6	2
Diuris longifolia	30	9	23	0
D. maculata	1000	50	81	2†
D. sulphurea	30	1	0	0
Eriochilus cucullatus	200	30	21	4
Glossodia major	3000	3000	117	136
Microtis unifolia	80	10	20	2†
Prasophyllum brevilabre	5	300	2	25†
P. despectens	50	1	*	*
Pterostylis longifolia	30	0	18	0
P. nutans	2000	2	15	0
P. parviflora	1000	300	36	10
Thelymitra chasmogama	4	0	0	0
T. ixiodes	100	3	10	1†
T. pauciflora	3000	1500	187	51†
T. rubra	200	30	13	1

* Survey squares not established in time for this species.
† Significantly different ($P < 0.05$) by Kruskal Wallis test.

soils, but retain heat longer (Priestly, 1959). Changes of soil temperature are more marked near the surface and can reach 60°C at a depth of 3 inches (Beadle, 1940). At Steels Creek, orchid tubers, especially those of *Pterostylis nutans* are frequently exposed in wombat diggings as shallow as 2 inches and could explain the vulnerability of this species to fire.

Other factors possibly influencing the response of orchids to fire include the effects of fire on the mycorrhizal fungi on which the orchids depend, and the absorption into the soil of fire-released nutrients, such as potash. These would tend to be washed away from the ridge at Steels Creek because of the relatively impervious soil, but be more likely to be absorbed locally at Anglesea. This movement of nutrients could in part explain the decrease in orchid flowers at Steels Creek and also the increase observed downhill, around the perimeter of the burn.

The response of orchids to fire has always attracted great interest, yet there seems to be little more than passing references to one or two species in the literature (Erickson, 1965; Withner, 1974; Gill, 1975 and 1981). There is a popularly held generalization that fire benefits orchids, and indeed some species e.g. *Prasophyllum brevilabre, Caladenia menziesii* R.Br., *Lyperanthus nigricens* R.Br., *Burnettia cuneata* Lindl., do flower dramatically after fires. However, a few species are probably detrimentally affected by severe fires, at least in the short term, and many others eg. *Diuris sp., Calochilus sp.,* would seem to show a variable response depending on local conditions. Unfortunately whilst an increase in flowers is likely to attract attention, a decrease may often pass unnoticed.

Any apparent change in orchid numbers in the first post-fire season may not necessarily indicate the real long-term effects on the orchid population. Flowering is from tubers grown in previous years and an initial increase simply indicates that a greater proportion are stimulated to flower. Similarly an initial decrease may be a result of a depression of flowering; however, where non-flowering plants are also much reduced, as in *Pterostylis nutans,* tuber loss is possible. Only long-term observations after fires will determine the effects on the various species and it is intended to continue the present study for many years. The short and long-term effects of all variables, including the severity and time of year of the fire, need to be studied for a wide range of orchids in a variety of habitats before reliable predictions of post-fire orchid populations can be made.

Acknowledgements

I wish to thank the National Parks Service, J. Blake and L. and C. Ahern for permission to work on their land.

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Mistaken Identity of a Worm at Macalister Springs, Victoria

By Joan Powling[1] and Michael G. Sedgley[2]

The erroneous identification of an aquatic worm some twenty years ago and its subsequent inclusion in a guide to the Victorian alpine region has conferred upon the locality of Macalister Springs a certain notoriety with respect to the quality of its water.

An early, and now out of print, edition of the Melbourne University Mountaineering Club's Guide to the Victorian Alps (1970) states that the water at Macalister Springs contains "parasitic nematode worms and their eggs and it is important that it be boiled before drinking". A similar caution is marked also on the most commonly used map of the area. (Victorian Mountain Tramping Club. King, Howqua, Jamieson Watersheds Area Map 1:70,000. S. Brookes.) There is no mention of worms in the M.U.M.C. guide (1974) but they seem to have become part of bushwalking folklore and the instruction to boil the water has been repeated in guide books from other authors (Thomas, 1977).

Boiling of the spring water for drinking purposes, while not unreasonable if faecal contamination is suspected, is quite unwarranted on account of the worms. They have been shown to be completely harmless flatworms. Also, human contamination of the spring water is less likely to be of concern now that a septic tank has been installed at the Vallejo Gantner Hut.

However members of the Hut's Committee of Management have found that an excessive amount of firewood, intended for use during winter by persons seeking refuge, is being used by summer visitors anxious to boil their drinking water.

In order to settle the two issues in question, early in November 1983 several specimens of the worms were collected from the underside of stones in the stream immediately below the spring and submitted, live, for identification. At the same times samples of water were taken for bacteriological analysis from three sites: the spring at its source, the stream below the spring and the pipe supplying the drinking water. Standard methods were adhered to for collection, preservation and transport and the samples were delivered to the laboratories of the State Rivers and Water Supply Commission in Armadale for testing the next day.

Escherichia coli, the indicator bacterium most commonly used in water quality monitoring, was not detected in 100ml of any sample. Faecal streptococci were absent also. Total coliforms were less than 5 per 100ml and total plate counts at 37°C were less than 5 per ml. These results, all of which satisfy the WHO International Standards for Drinking Water (1971), simply indicate that the spring water was free from faecal contamination, and therefore safe to drink, at the time of sampling. Further samples will be collected from time to time therefore to determine to what extent visitor usage or seasonal conditions affect the bacteriological quality of the water.

The worm was identified as a turbellarian or flat-worm, also known as a planarian. It is not a nematode (which is a round worm) and is not parasitic. It is a primitive worm, a member of the phylum Platyhelminthes, class Turbellaria, order Tricladida. It was fully identified only recently, by David Hay of the Department of Genetics and Human Variation, Latrobe University, as *Spathula tryssa* Ball, 1977, a species which to date has been collected from only one other site in Victoria, a spring immediately below the summit of Mount Buller (Hay and Ball, 1979).

Turbellarians are soft-bodied, mostly flattened animals ranging in length from about 5mm to 10cm with most species less

1. 266 Station Street, Fairfield, Victoria, 3078.
2. 806 Malvern Road, Armadale, Victoria, 3143.

than 3cm (Williams, 1980). *S. tryssa* is 9-10mm long. Almost all are hermaphroditic and reproduce sexually, however several species are extremely adept at regeneration, reproducing asexually by transverse fission. Fertilised eggs hatch directly to miniature adults and there is no larval stage. It is possible that resting eggs are produced in order to withstand the extremes of heat and cold experienced in most Australian localities but they have yet to be found.

The animals are found mostly under stones and in other dark places. They move by gliding over the substrate and seem incapable of swimming. Their food consists of live or decaying animal material and quite large particles can be consumed — a surprising feat for such a small, slow-moving animal. Species such as *S. tryssa* which inhabit a spring probably retreat underground to damp crevices in order to survive unfavourably dry periods.

The freshwater turbellarians of the Australian alpine region, having been virtually ignored in the past, are now attracting more attention due to the efforts of David Hay and Ian Ball of the Institute for Taxonomic Zoology, University of Amsterdam. In the past summer they have collected specimens from the Tasmanian high country and added considerably to their knowledge of the Australian representatives of this group of animals. All species so far known from Australia belong to the most primitive family, the Dugesiidae, which suggests that all freshwater turbellarians originated in the Southern Hemisphere, possibly in what is now Antarctica.

Many species are not only very restricted geographically, often being confined to a single mountain, but are also morphologically diverse and so could be important in future ecological studies. The ability of different species to adapt to similar conditions of heat and cold, flood and drought, would be of particular interest on account of the extreme variation in these conditions experienced in the Australian alps.

So, the flat, creamy white worms which must have looked so sinister to the instigator of the myth of the "parasitic nematode worms of Macalister Springs", might receive more publicity in future, not as something to be wary of but to be preserved as a reference species for future environmental studies of the Victorian alpine region.

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Artificial Hybrids produced by the Pollination of *Eucalyptus regnans* F. Muell. by *E. obliqua* L'Herit. and *E. baxteri* (Benth.) Maiden and Blakely at Foster North, Victoria.

By D. H. Ashton*

Introduction

Hybridization between *E. regnans* F. Muell. and *E. obliqua* L'Herit; both of the ash group, informal series *Obliquae* (Pryor and Johnson, 1971), has been accepted for many years (Ewart, 1930; Clifford, 1951; Ashton, 1958, 1981 and Griffin and Eldridge, 1980). Trees with intermediate characteristics occur in the ecotones between forests of *E. regnans* and *E. obliqua* and, where they show a wide variety of forms they are likely to represent hybrid swarms in the sense of Anderson (1954). Very complex eucalypt populations occur on Wilson's Promontory which suggest the genetic involvement of *E. obliqua* with at least four other members of subgenus *Monocalyptus* (Smith, 1970). On Mt. Leonard, a few trees occur which possess gum-barked crowns and a distinctly raised disc to the fruits. This combination of characters suggests hybridity between *E. regnans* and *E. baxteri* (Benth.) Maiden and Blakely (a stringybark of the series *Capitellatae),* even though these species are separated by more than one kilometre.

In 1979 it was decided to attempt to produce hybrids between *E. regnans* and some of its related species that occur on Wilson's Promontory. The use of *E. regnans* as the female parent on Wilson's Promontory was impossible due to the size of the trees and the inaccessability of the stands. However, at Foster North, open-grown trees of a natural forest remnant occurred in the garden of Mr Brian Greer where abundant bud production was present on branches to within 1.5m of the ground. With his kind permission this tree was used in the cross pollination experiments.

Methods

Since the major period of flowering of *E. obliqua* and *E. baxteri* occurs 1-2 months earlier in the season than *E. regnans* (Ashton, 1981), pollen was collected from freshly opened umbels, desiccated for 14 hours and stored in a frozen state. The general procedure adopted was that of Eldridge (1963) together with suggestions made by Dr A. R. Griffin. Pollen from typical *E. obliqua* (with insert fruit valves), *E. baxteri* and an intermediate between these two species was collected

Fig. 1. F_1 seedling groups at Olinda, 1983. *(E. regnans* × *E. baxteri).*

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on Wilson's Promontory from the lower slopes of Mt Bishop along the Lilly Pilly track in early February.

Fully mature buds of *E. obliqua, E. baxteri* and *E. regnans* were carefully emasculated with a sharp razor blade on 8 March 1979 and the umbels bagged with fine green organdie cloth. Fourteen days later, when the stigmas were judged to be receptive, the frozen pollen collections were thawed for 3 hours and dusted onto the stigma with fine paint brushes.

On 28 June at the Foster North garden, 8 young developing capsules of *E. regnans* × *E. obliqua*, 9 *E. regnans* × *E. baxteri* and 2 *E. regnans* × intermediate *(E. obliqua — E. baxteri)* were present within the bags. Along the Lilly Pilly track none of the cross-pollinated *E. obliqua* flowers persisted on the branch selected, and, although reciprocal crosses of both *E. obliqua* and *E. regnans* and *E. baxteri* were deemed successful before the school holidays in early May, neither bags nor developing fruits survived that event. In July at Foster North, the bags were removed and the ripened fruits were harvested in February the following year.

Seeds were placed on moist filter pads and kept at room temperature in March and April 1980. The seeds of the parental species germinated within 2 weeks, but the hybrid seed did not do so for 3-4 weeks. Eleven seedlings of *E. regnans* × *E. obliqua* and 5 seedlings of *E. regnans* × *E. baxteri* were finally raised in the glasshouse, the potential number having been halved by a laboratory error. In September, seedlings were 30-40cm tall and were hardened for 6 weeks in the open prior to being assessed and planted in the field. With the co-operation of Mr F. May of the Forests Commission of Victoria these and other trials were planted in the R. J. Hamer Arboretum near Olinda in a relatively open, but remote bracken site on the ecotone between forests of *E. cypellocarpa* L. A. S. Johnson — *E. obliqua* and *E. regnans* (Fig. 1).

The initial plantation was laid out in a rectangular design 25×25m in area, on a 200m slope of 15° to the NE, each population being in groups of 4 spaced 3m apart and separated from adjoining populations by 4m. A random design was not adhered to because the inevitable competition would lead to the demise of the slower growing species. The more mesic species (e.g. *E. regnans)* were placed furthest down the slope, the more xeric species (e.g. *E. baxteri, E. macrorhyncha* F. Muell. ex Benth.) higher on the slope, and the hybrids in intermediate positions. Plants were manured and watered at intervals during the first summer and were measured at 6-12 month intervals. Seedling numbers were reduced by various mishaps including severe lean or breakage of some plants due to heavy unseasonably early snowfalls and severe winds during 1983. Sufficient individuals have been successfully established to enable growth and habit features to be assessed, although, until December 1983, mature fibrous or subfibrous bark had not developed. Precocious bud development had occurred on all the *E. baxteri* seedlings. It is intended to assess the fully developed trees some years hence, and if possible, to allow selfing of the F_1 hybrids with a view to assessing the segregation and dominance of various traits, particularly those of fruit shape and the proportion of gum-bark to fibrous bark on the trunks.

Results and Discussion

The features of the juvenile foliage at the seedling stage were assessed in August 1980 whilst the plants were glasshouse-grown. (Fig. 2).

The F_1 plants of both the *E. regnans* × *E. obliqua* and *E. regnans* × *E. baxteri* crosses were clearly intermediate between the parental species and their future development is awaited with interest. However, some features closely resemble one or other parent, suggesting allelic dominances. These results of leaf shape, size, surface and oil gland features as well as plant size and lignotuber development

Fig. 2. Photographs of parental and hybrid seedlings 6 months old.

are given in Table 1.

The progressive height growth of these seedlings is given in Fig. 3.

The results indicate the general height superiority of *E. regnans,* some individuals being 10.0m tall after 3½ years.

Many of the F_1 *E. regnans* × *E. obliqua* equalled the stature of *E. regnans.* A somewhat similar pattern was found by Griffin and Eldridge (1980) in plantations of *E. regnans* and intermediate *E. regnans* — *E. obliqua* populations. *E. obliqua* was less vigorous, and *E. baxteri* the poorest. The very low growth rate of the latter species may be due to the choice in the experiment of a convenient woodland-heathland form. One individual from the *E. regnans* × *E. baxteri* cross was bushy, with shorter leaves and may be an unusual recombination or a mutant. Lignotuber development was slight in the hybrids, and after 2 years was obscured in all species by the basal expansion of the trunk.

In 1981, a gum-topped stringy-barked tree (30m tall) at Kalorama was found growing mixed with *E. baxteri,* but 50m from *E. obliqua* and 75m from *E. regnans.* Because of the slightly raised disc of the fruit and the gum top of the trunk it was thought to be a natural *E. regnans* × *E. baxteri* hybrid for some overlap of flowering times occurs between these species. Accessible fruiting branches which overhung power lines were kindly collected by officers of the State Electricity Commission. Seedlings were raised in

Table 1. Seedling characteristics 3.9.1980 (5 months old) (no. in brackets).

Character	Unit	*E. regnans* (8)	*E. obliqua* (7)	F_1(8)	*E. regnans* (8)	*E. baxteri* (8)	F_1 (4)
Height	cm	11.6	11.1	12.8	11.6	9.3	9.5
N°. leaf nodes	N°	6.0	6.0	6.0	6.0	6.0	6.0
Length × breadth *3rd node*	cm	6.4 × 3.0	8.1 × 3.1	7.3 × 2.8	6.4 × 3.0	5.2 × 3.3	5.4 × 2.5
Petiole length *3rd node*	mm	4.4	2.0	2.9	4.4	0	2.0
Tip angle *3rd node*	degrees	58	65	58	58	104	78
Av. oil gland N° *3rd node*	No/cm²	525	142	308	525	789	530
Av. oil gland diameter *3rd node*	nm	57	117	95	57	61	64
Av. leaf hair N° *3rd node*	No/cm²	0	0	0	0	10.1	10.9
Av. leaf hair length *3rd node*	nm	0	0	0	0	367	137
Lignotuber N°	No/plant	0	2.0	0.6	0	2.5	2.8
Lignotuber size: to stem immediately above	% increase of diam.	0	16.3	6.5	0	47.0	23.2

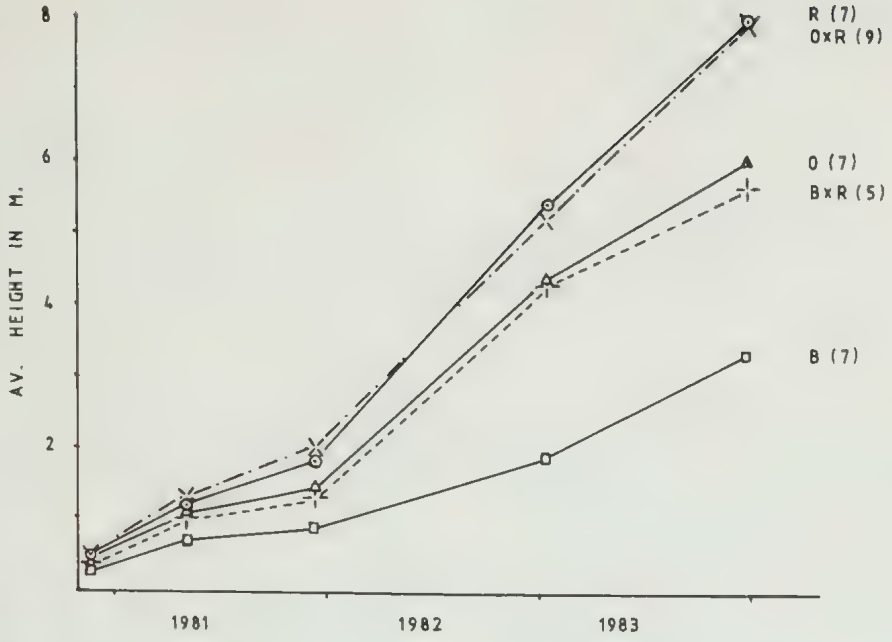

Fig. 3 Graphs of the height growth of parental species and F hybrids. R = *E. regnans*, O = *E. obliqua*, B = *E. baxteri*, O × R and B × R = F hybrids. Non-parametric statistical tests (Mann-Whitney test in Sokal and Rohlf, 1969) indicate that the 3 groups, R-O×R, O-B×R and B were significant at p − 0.05-0.001. The differences between R and O×R and between O and B×R were not significant.

the glasshouse but no *E. baxteri* foliage characters were detected. It is possible that it is a hybrid of *E. regnans* and *E. obliqua* with introgression of some *E. baxteri* genes which involve fruit shape and the toughness of stringy bark.

E. fastigata H. Deane and Maiden from an Errinundra seed source was raised to enable a comparison to be made with *E. regnans — E. obliqua* hybrids with which it may be confused. Seedlings of *E. fastigata* in the Olinda plantation have remained distinct for 3½ years due to their smaller, narrower, darker green and more glossy foliage.

The hybrids produced by artificial cross-pollination have again shown the interfertility of the series *Obliquae* and *Capitellatae* of the subgenus *Monocalyptus*. Artificially produced F_1 hybrids between species of different sections have been documented by Pryor (1976) in this and other eucalypt subgenera. The importance of these trials lies in establishing a base-line for the interpretation of variation between these related species. In the long-term, these may be important in the manipulation of populations to produce better timber quality and greater resistance to low nutrients, drought or fire.

Acknowledgements

I would like to thank Mr J. Yugovic and Ms S. McIntyre for help in pollination work and Mr P. Kristensen and Mr J. Pederick for assistance in laboratory and plantation work.

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Egg Deposition Site in the Gecko *Diplodactylus williamsi*

By G. M. Shea*

Bustard (1968a,b; 1969; 1971) studied the ecology of five species of gecko, *Gehyra australis, G. variegata, Heteronotia binoei, Diplodactylus williamsi* and *Oedura monilis* in the Pilliga Scrub in northern New South Wales. The first three species, all gekkonines, were found to lay their calcareous shelled eggs in relatively exposed positions, mostly under bark and boards on ground. Bustard was unable to locate any deposited eggs of the diplodactylines *D. williamsi* and *O. monilis.*

Indeed, with the exception of Milton's (1980) record of 32 *Oedura tryoni* eggs under well embedded fence palings, McPhee's (1979) observation that *O. marmorata* oviposits in crevices or under bark, and Bustard's (1967) note that captive *O. monilis, O. tryoni* and *O. lesueurii* deposited eggs in moist sand under rocks and bark, literature records of egg deposition sites in the genera *Diplodactylus* and *Oedura* appear to be absent. Jenkins and Bartell's (1980) observation that *D. vittatus* commonly oviposits beneath a rock or log is doubtful, as they further state that the eggshell is calcified, a gekkonine rather than a diplodactyline characteristic (Bustard, 1968c).

While undertaking general collections of reptiles on 21 April 1984 at Gwabegar, N.S.W. (30°37′S, 148°58′E), approximately 25km N of Bustard's study site, I found two pairs of oval parchment-shelled eggs (one egg represented by a shell only) in separate, otherwise unoccupied burrows typical of those made by *Varanus gouldii.* Numerous other varanid burrows were seen in the immediate vicinity. The eggs were situated at the end of the burrows, approximately 1m from the entrance and approximately 30cm below the surface.

One of the intact eggs was incised on 24 April 1984, and was found to contain a live, near full-term *Diplodactylus williamsi* embryo (Australian Museum R112359; SVL = 22mm). The remaining two eggs were placed on moistened tissue paper and incubated at room temperature. One egg (AM R112360; 15.2mm × 9.5mm on 24 April) began to collapse and discolor on 3 May 1984, while the other (AM R112361; 15.9mm × 9.7mm on 24 April) began to collapse on 7 May 1984. Both eggs were opened after preservation and found to contain *D. williamsi* embryos at a similar stage of development to the first.

The smallest wild-caught specimen of *D. williamsi* in the Australian Museum collections (R27985; Warrumbungle Mtns; SVL = 34mm) was collected 27 May 1964, while Bustard's smallest specimen, collected July 1964, had SVL = 32mm.

D. williamsi is a member of the subgenus *Strophurus* and the *strophurus* species group, comprising in addition the species *ciliaris, intermedius, rankini, spinigerus, strophurus, taenicauda* and possibly *wilsoni* (Kluge, 1967; Storr, 1979,

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1983). All except the saxicoline *wilsoni* are usually arboreal or semiarboreal (Bustard, 1969; Dale, 1973; Pianka and Pianka, 1976; Ehmann, 1980; Storr and Hanlon, 1980; Bush, 1981), although some arid populations of *D. intermedius* and *D. ciliaris* are ground-dwelling (H. G. Cogger, pers. comm.), and individuals of most species are sometimes found active on the ground at night (Pianka and Pianka, 1976; Bush, 1981; A. E. Greer, pers. comm.; pers. obs.).

D. williamsi, in contrast, was found by Bustard (1969) to be almost completely arboreal, spending the warmer months on the upper trunk and branches of dead trees, and descending from April to hibernate until early September under fallen bark, or more commonly within 1m of ground level in dead trees or stumps. Mating in captive populations was observed only in October. Assuming that egg deposition occurs between October and April, when the above eggs were found, the gravid females must, in this instance, have made a second descent to ground level, during the summer arboreal period.

If mating in wild populations is confined to October, and fertilisation occurs soon after, the occurrence of near hatching eggs in late April suggests a total development time of over 6 months. By April, most eggs of the three gekkonine species studied by Bustard had hatched. Hatching of underground *D. williamsi* eggs in late April may allow the neonates to immediately overwinter in the same near ground sites as adults.

The parchment-shelled eggs of diplodactylines require a moist environment to maintain hydration during development (Bustard, 1967), and it is possible that the arboreal situations inhabited by the adults in summer are not humid enough to prevent dehydration of the eggs. The laying of eggs below ground would seem to provide the necessary hydric environment for egg development. If the eggs of *D. williamsi* are, as the above observation suggests, laid in burrows below ground, it may additionally explain the poor recruitment to the population observed by Bustard following two wet years, waterlogging of the soil preventing development.

Acknowledgements

I am grateful to Dr. H. G. Cogger and Dr. A. E. Greer for allowing me access to Australian Museum material, and providing useful comments on the manuscript. Bradley Fleming assisted with the field work at Gwabegar.

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Bush-peas of Victoria — Genus *Pultenaea* Sm. (Fabaceae) — 20

By M. G. Corrick*

***Pultenaea scabra* R.Br. in Ait.f., *Hort. kew.* ed.2, 3:18(1811).**

P. scabra is a spreading to tall and slender shrub, 1-3m high. The stems are terete and usually densely hairy with a mixture of short and long pale, or sometimes rusty, hairs.

The leaves are alternate, obcordate, 3-16mm long and 2-13mm wide. The leaf tip is often widely emarginate, the mid-rib terminating in a short, recurved point. The upper surface is usually covered with scattered tubercle based hairs, occasionally it is glabrous but not smooth. The lower surface is paler with short, appressed hairs; longer, spreading hairs are usually present on the mid-rib.

The stipules are triangular, 1-2mm long, dark brown and with slightly recurved tips.

The inflorescence is a condensed raceme forming a dense head-like cluster near the end of short lateral shoots.

The bracts are imbricate, almost orbicular, occasionally two lobed and very deciduous.

The bracteoles are lanceolate, 2-3mm long and densely hairy down the centre and usually with a papery, less hairy margin. They are attached at, or below the centre of the calyx tube and do not extend beyond the tips of the lobes.

The calyx, including the short pedicel, is 5-6mm long and densely hairy. The lobes are shorter than the tube and taper abruptly into slender, acuminate tips.

The flowers have an orange standard with dark red lines at the base on the front surface; the back is darker, with longer, denser red lines. The keel is very deep red, the wings are orange, sometimes slightly shaded with dark red.

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The ovary is densely hairy with scattered hairs extending more than halfway along the style.

The pod is well exserted from the calyx, brown and covered with scattered, pale hairs.

Flowering time is from early September to late October.

P. scabra is widespread in forests of southern Victoria, on, and south of the Dividing Range. It also occurs in New South Wales and South Australia.

Variation and possible hybridization

P. scabra is a most variable plant. The typical form, from the Blue Mountains of New South Wales, does not extend into Victoria. "Some forms have been given specific or varietal names but further collections and examination of material over the whole range of the species would be necessary for a satisfactory subspecific classification" (Thompson 1961, p.60).

A leaf from one of the type collections of Robert Brown and a selection from Victorian collections are illustrated in Figure 33.

Several colonies of plants growing in close association and showing a gradation

Fig. 34. Known distribution of *P. scabra* in Victoria.

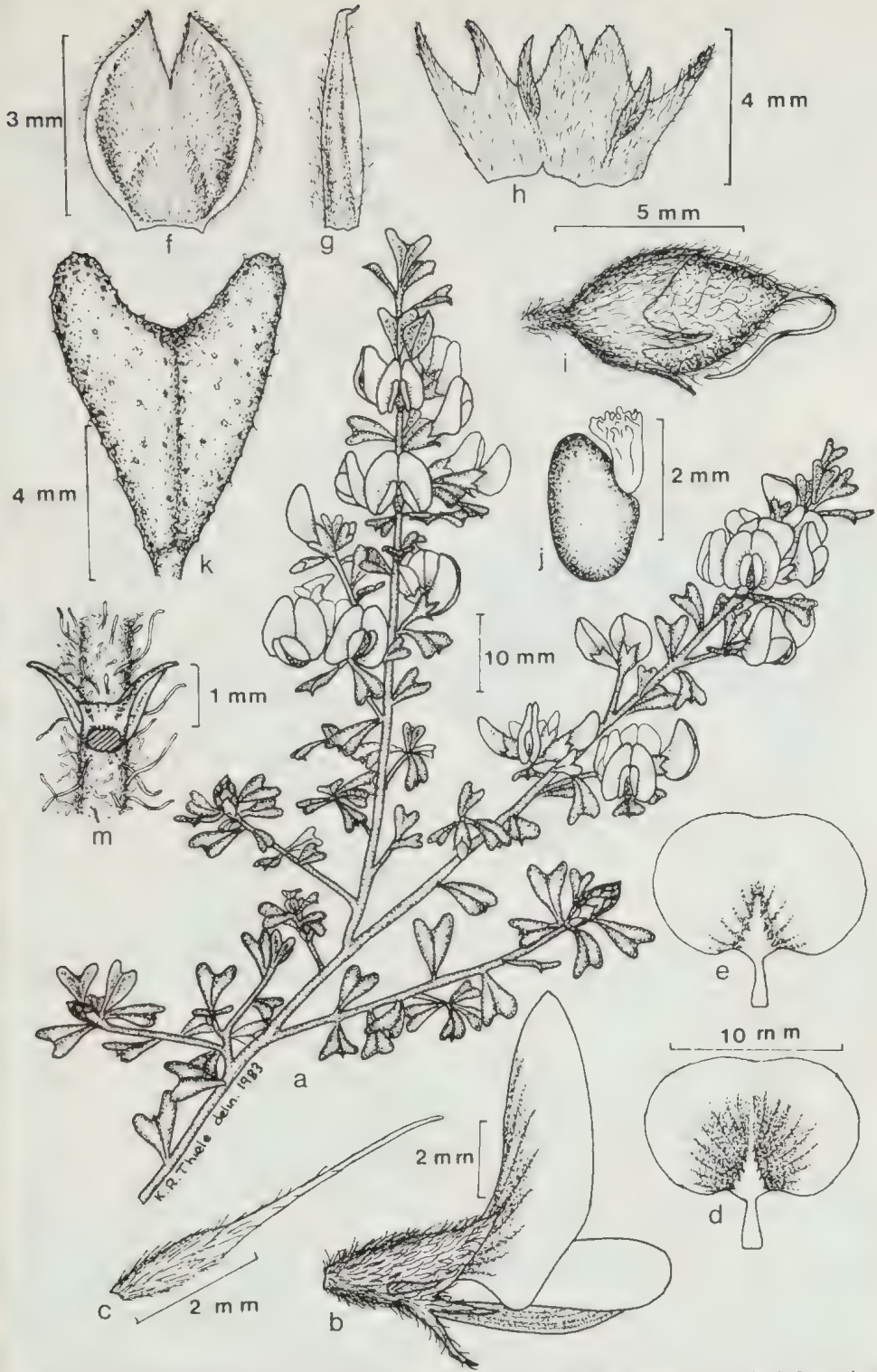

Fig. 32. *Pultenaea scabra*. a, habit x 1; b, flower; c, ovary; d, standard (rear view); e, standard (front view); f, floral bract; g, bracteole; h, calyx, spread open; i, fruit; j, seed; k, leaf from above; m, section of stem with stipules, leaf removed; all from MEL 658955 except i and j from MEL 1507675.

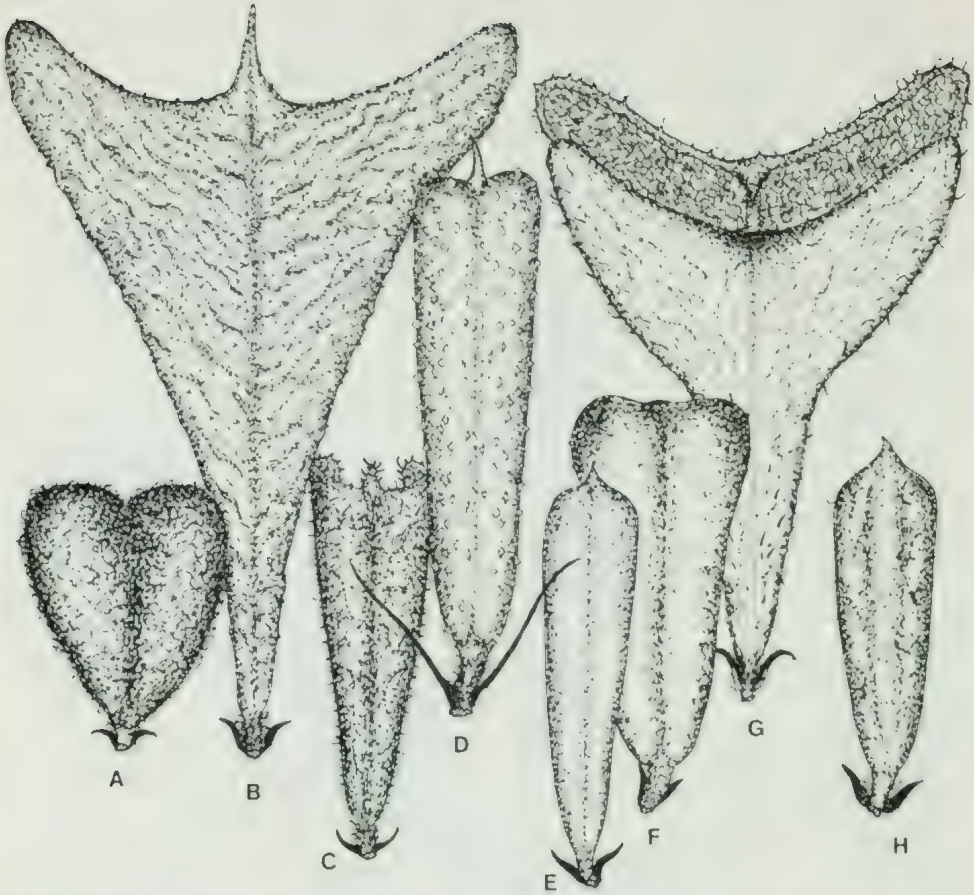

Fig. 33. *P. scabra*, showing various leaf forms. A, Grampians (MEL 663121); B, Ringwood (MEL 1517259); C, Grampians (MEL 663112); D, typical form, Blue Mts., N.S.W. (MEL 357297); E, supposed hybrid, Grampians (MEL 516324); F, Victoria Range (MEL 658954); G, Lang Lang, lower side of leaf apex also shown (MEL 528683); H, Montrose (MEL 568429).

of leaf forms and floral characters between *P. scabra* and *P. benthamii* have been observed in the Grampians, suggesting possible hybridization.

In the high, rocky parts of the Grampians Victoria Range between the Chimney Pot and Mt. Thackeray a distinctive form occurs which has been mistaken for *P. maidenii*. It is similar to some of the supposed hybrids but appears to be well established and maintaining itself without close association with *P. scabra* and *P. benthamii*. Further study may show this to be worthy of recognition as a distinct taxon. *P. maidenii* will be dealt with later in this series.

SPECIMENS EXAMINED included: NEW SOUTH WALES: River Grose, *R. Brown* (MEL 35297 — ? type); VICTORIA: Lind National Park, *Beauglehole 34153* (MEL 663070), 27.ix.1970; Lr. Glenelg R., *Beauglehole 431* (MEL 151127), x.1946; Montrose, *D. Parkes* (MEL 568429), 11.v.1979; Lang Lang, *A. B. Wellington* (MEL 528683), xii.1976; Grampians: Near Castle Rock, *A. H.*

Corrick (MEL 658954), 3.xi.1982; Mt. Sturgeon, *M. G. Corrick 5759* (MEL 663121), 21.xi.1976; Jimmy's Creek Rd., *M. G. Corrick 5744* (MEL 516324), 20.xi.1976; between Hall's Gap & Rose's Gap, *T. Henshall* (MEL 663112), 5.xi.1967.

Acknowledgement

I am most grateful to Kevin Thiele for the drawings accompanying this article.

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Does *Platylobium alternifolium* F. Muell. (Fabaceae) occur in the Bolangum Ranges?

BY J. H. ROSS*

Platylobium Sm., a small genus of four species in the tribe Bossiaeeae, occurs in eastern Australia from the vicinity of Wide Bay in south-east Queensland southwards to Tasmania and westward to Kangaroo Island in South Australia. All four species occur in Victoria but *P. alternifolium,* unlike the others, is confined to this State.

As the name implies, *P. alternifolium* has alternate leaves, a feature thought by Mueller when describing the species in 1883 to be unique to it as all species previously recognized in the genus had opposite leaves. Specimens of *Platylobium* with alternate leaves occur sporadically in Victoria from the Grampians in the west to Gippsland in the east and it had become customary to refer all specimens with alternate leaves to *P. alternifolium.* However, a recent study of the genus (Ross, 1983) revealed that many of the specimens with alternate leaves belong to an atypical variant of the polymorphic *P. formosum* Sm. and not to *P. alternifolium.* Consequently *P. alternifolium* has a more restricted distribution than previously believed being confined to the Grampians and apparently the Bolangum Ranges situated between Stawell and St. Arnaud. When in flower, *P. alternifolium* is distinguished readily from *P. formosum* and the other species in that the calyces are glabrous outside except for a conspicuous fringe of hairs on the margins of the lobes; in other species the calyces are clothed with appressed or spreading hairs throughout externally. In addition, the pedicels in *P. alternifolium* are concealed by a series of distichous scales and bracts along their length whereas in *P. formosum* the pedicels are exserted from the basal bracts and scales. Sterile specimens with alternate leaves are more difficult to identify with certainty.

* National Herbarium of Victoria, Birdwood Avenue, South Yarra, 3141.

The only specimen of *Platylobium* with alternate leaves from the Bolangum Ranges is a sterile one in the National Herbarium of Victoria collected by J. W. Audas in November, 1920. The specimen is apparently referrable to *P. alternifolium* although in view of the difficulty in identifying sterile specimens positively there is an element of doubt. Audas (1921) made special mention of the unexpected occurrence of what he believed to be *P. alternifolium* in the Bolangum Ranges commenting "In such a poor locality one scarcely expects to find rarities, but nevertheless we discovered the Alternate-leaf Flat-Pea, *Platylobium alternifolium* . . ."

Audas gave no indication of the route he took after leaving the Kingston mine and locating *P. alternifolium* so it is not possible to re-trace his steps. Unfortunately recent attempts to locate *P. alternifolium* in the Bolangum Ranges have been unsuccessful which, of course, does not mean that it is not there. However, it is possible that changes in land usage in

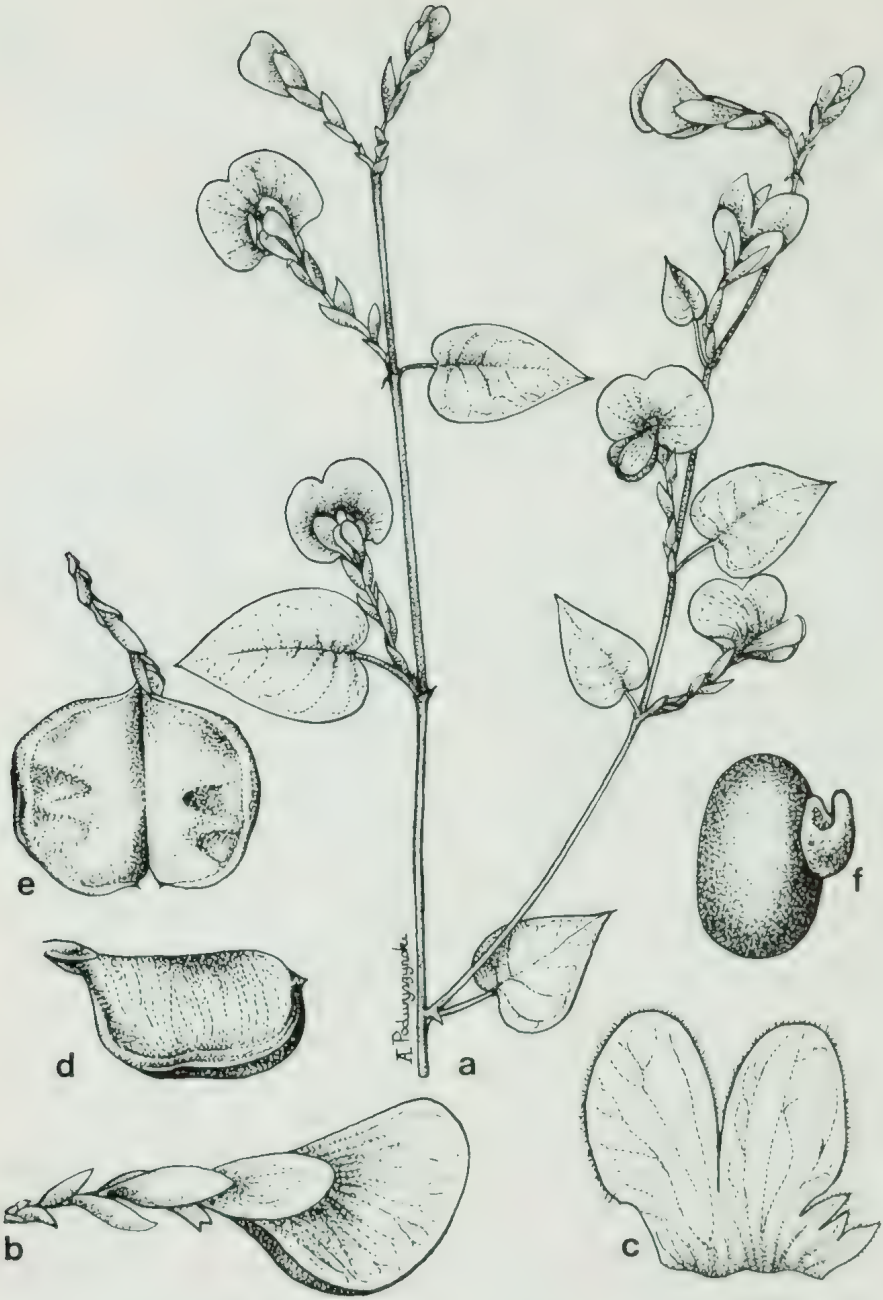

Fig. 1. *Platylobium alternifolium*. a, flowering twig, X 1; b, flower, with a series of distichous scales and bracts along the length of the pedicel, X 2; c, calyx opened out (upper lobes on left), X 4; d, pod, side view, X 1.5; e, pod, after dehiscence, X 1.5; f, seed, side view, X 6. a-c from M. G. Corrick 6801 and P. S. Short (MEL); d-f from A. C. Beauglehole 30754 (MEL).

the Bolangum Ranges during the last sixty years have resulted in the disappearance of the species. The record of *P. alternifolium* in the Bolangum Ranges is unexpected as the habitats available there appear to differ significantly from those in the Grampians where *P. alternifolium* occurs. Had Audas not commented specifically on the occurrence of *P. alternifolium* in the Bolangum Ranges it would be tempting to suspect that the specimen was collected in the Grampians and inadvertently labelled as having been collected in the Bolangum Ranges.

The purpose of this note is to draw attention to this unconfirmed record of *P. alternifolium* from the Bolangum Ranges and to invite interested naturalists to search for *Platylobium* species in the Bolangum Ranges and send specimens (preferably fertile) to the National Herbarium of Victoria for identification.

Acknowledgement

I am most grateful to my colleague, Miss A. M. Podwyszynski, for preparing the accompanying illustration.

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A Luth (Leathery Turtle) on Mud Islands

BY DON TEESE[1] AND RICHARD H. LOYN[2]

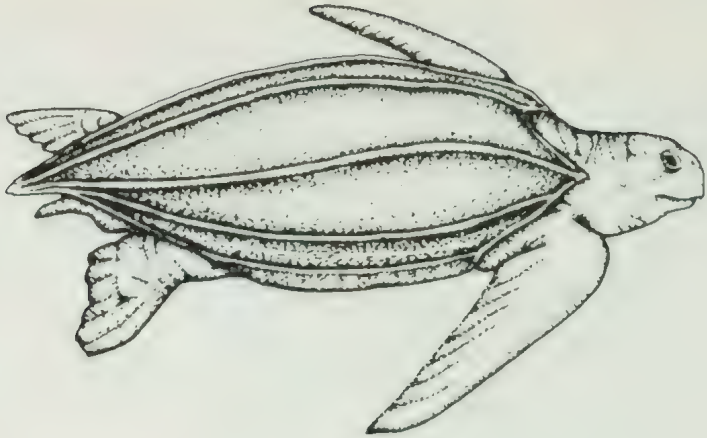
Marine turtles are generally regarded as rare in latitudes higher than about 30° (Houston, 1979) and they are infrequently reported from Victorian waters. On 9 October 1983 we found a dead Luth or Leathery Turtle *(Dermochelys coriacea)* on Mud Islands (38° 16'S, 144° 46'E) in Port Phillip Bay, Victoria. We were on the north-east corner of the islands, when we stumbled on the corpse a few metres above the high tide-line among shrubby Coast Saltbush *(Atriplex cinerea)*. It appeared that it had crawled there and died, though it is possible that a storm had deposited the corpse. It was badly decomposed, with bones free from the body and little if any flesh remaining on the skin; a strong foetid smell persisted. It was about 1.5m long, with prominent longitudinal ridges on the carapace. The corpse was later collected by Peter Menkhorst (Arthur Rylah Institute for Environmental Research) and has been lodged with the Museum of Victoria (MV specimen D57420). The carapace measured 108cm long and 82cm wide.

Physical injuries were not apparent and the gut did not contain material such as plastic which is a common cause of death in this species (P. Menkhorst, pers. comm.).

Of all the marine turtles, Luths are the most likely to occur in temperate seas as they have the most efficient thermoregulatory mechanism (Friar *et al.*, 1972) and may actively seek cooler waters in search of jellyfishes (Cogger, 1975). A very small number breed in Queensland but most individuals in Australia are thought to come from breeding colonies north of the Coral Sea, e.g. Fiji or the Solomon Islands (Limpus and McLachlan, 1979).

South of their normal range there have been a few previous records from Victoria (Warneke and Coventry, pers. comm.) and two are mentioned by Limpus and McLachlan (1979), as well as at least seven from South Australia (Houston, 1972),

1. 9 Lamont Avenue, The Patch, Victoria, 3792.
2. Lot 209, Monbulk Road, Emerald, Victoria, 3782.



Leathery Turtle (Luth) — *Dermochelys corracea.* Drawing by Bronwen Scott.

seven from Tasmania (Green, 1971; Van Tets *et al.,* 1974) and nine from New Zealand (McCann, 1966). In southern Queensland most individuals were seen in mid summer (Limpus and McLachlan, 1979) but the extralimital records above have mainly been of adults in autumn.

Our individual may have entered the bay in autumn, become trapped and died at some stage in the winter as water cooled or food became scarce. More observations are needed to determine whether Luths and other turtles are regular or accidental visitors to the seas of Victoria and Bass Strait.

Acknowledgements

We thank David Nicholls who arranged this visit to Mud Islands, Peter Menkhorst who collected and measured the specimen and Bob Warneke and John Coventry for comments.

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Baldwin Spencer Lodge

It will be of interest to members to hear that an additional group lodge at Tidal River in Wilsons Promontory National Park is to be named the Baldwin Spencer Lodge, after Professor Sir Walter Baldwin Spencer. President of the Field Naturalists Club of Victoria for some years in the 1890's, he was in the forefront of the campaign to declare the Wilsons Promontory National Park, and became Chairman of the first Committee of Management in 1908. He was Professor of Biology at Melbourne University and Honorary Director of the National Museum. It is anticipated that the lodge will be open for bookings from the beginning of the school year in 1985.

Observations on the Pollination Ecology of *Eucalyptus muellerana* Howitt in East Gippsland

By J. C. Ireland* and A. R. Griffin**

Introduction

The flowers of *Eucalyptus* are visited by a wide range of insects, birds and mammals (Griffin, 1982) and this observation has led to various conclusions that the genus is pollinated by vectors most of which are insects (Pryor, 1976), predominantly ornithophilous (Faegri & van der Pijl, 1979), or pollinated by a wide variety of vectors ". . . first by birds, later in the day by insects such as bees, flies and beetles and at night by mammals and possibly moths" (Ford *et al.*, 1979).

Eucalypt pollen has certainly been shown to be an important food source for lorikeets (Churchill & Christensen, 1970) and the feather-tailed glider (Turner, 1984); some honey-eaters rely on eucalypt nectar (Ford & Paton, 1977; Ford *et al.*, 1979) and this is also true of the honey possum (Hopper & Burbridge, 1982); while all insects observed feeding on the flowers may be assumed to be consuming a major component of their diet. However, it is not valid to infer from such observations that the respective animals are necessarily fulfilling a pollination function.

Effective pollination requires that visits occur at a time when stigmas are receptive; that feeding is non-destructive and involves regular stigma contact; that body structure is such that pollen is carried on those parts of the body which make stigma contact; that inter-tree movements are frequent and that population sizes are such that significant quantities of pollen are transferred. Only when such information is available for the complete array of flower-visiting animals can the effective pollinators of a particular species be determined.

The most distinctive feature of the eucalypt flower bud is the operculum, which is shed at anthesis. The open flower thus has no perianth, but visitors are attracted by numerous showy stamens. Nectaries, situated on top of the receptacle around the base of the style, secrete copious nectar. While all species have this generalised flower structure (Pryor, 1976), they do vary substantially in a number of traits such as flowering time, blossom structure and flower size, colour, presentation and degree of nectar exposure (Griffin, 1982).

There are corresponding differences in effective vectors. For example *E. stoatei* has large flowers with filaments tightly incurved around the style and nectar is only accessible to honey-eaters (Hopper & Moran, 1981) while the more open dish-shaped flowers of *E. foecunda* Schau and *E. cylindriflora* Maid. & Blakely are considered to be pollinated by beetles (Hawkeswood, 1982). It is obviously not possible to generalise regarding eucalypt pollinators until a far greater body of observational data has been collected.

This paper reports a preliminary investigation of the pollinators of *E. muellerana* Howitt, a summer-flowering stringybark species which grows in the coastal ranges of eastern Victoria and southern New South Wales.

Methods

Observations were made between 14 October 1983 and 13 January 1984 on a group of five trees of *E. muellerana* growing in a natural stand in the Clifton Creek area, north of Bairnsdale, Victoria. The trees were in a mixed stand with *E.*

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globulus Labill. subsp. *maidenii* (F. Muell.) Kirkp.; *E. sideroxylon* A. Cunn. ex Woolls subsp. *tricarpa* L. Johnson, *E. polyanthemos* Schau; and occasional *E. bridgesiana* R. T. Bak. None of these species was flowering at the same time as *E. muellerana.*

The study period covered the complete flowering season. Trees were selected according to the accessibility of flowers to the observer, so observations relate to visitor activity on the lower branches only.

Observations were made on 19 separate days. Since animal activity was low on wet and windy days, such conditions were avoided. Casual observation also revealed little activity at night or early in the morning, and thus detailed observations were carried out only in daylight hours.

The blossom of *E. muellerana* consists of axillary inflorescences each containing up to 12 flowers (Hall *et al.,* 1970) with creamy-white filaments as the most obvious secondary attractant. At full development the inflorescence appears spherical with a diameter of about 30mm.

Floral development was studied *in vivo* on four marked flowers. Nectar secretion was measured on flowers enclosed in a terylene bag, over a 24-hour period from noon to noon. Every three hours a sample of three flowers was removed and nectar extracted from each with a 5 μl capillary tube. Flower visitors were recorded during 44 half-hour observation periods on observation units of 10-15 inflorescences, and insects were captured by hand at other times.

Feeding behaviour of each of the major visitor taxa was observed in order to assess potential for effecting pollination.

Results and Discussion

Floral Development

The course of development of the flower from operculum shed (day 0) follows that described for other eucalypt species (Pryor, 1976; Griffin & Hand, 1979). The flower is protandrous with filaments fully expanded and anthers dehisced by about day 2. Since the filaments become reflexed in this species the nectar secreted from the surface of the receptacle is easily accessible to visitors.

Even though pollen is shed, filaments persist for 12-14 days and thus continue to provide a visual attractant.

The style is about 3mm long at day 0 and doubles in length by day 4 when the stigma begins to expand and becomes receptive. The style abscisses after about 24 days.

Small quantities of nectar were collected from bagged flowers within 24 hours of operculum-shed and peak daily production of 5 μl per flower was reached by day 3. The major production period was overnight so maximum quantities of nectar were present during early daylight hours. The development pattern was somewhat faster than that reported for the autumn-flowering species *E. regnans* (Griffin & Hand, 1979) — a difference most probably due to ambient weather conditions.

Insect Visitors

Insects captured on flowers represented four orders, with 41 species from 29 families (Table 1). However as can be seen from Table 2 only a few taxa were frequent in any one observation period.

Effective Vectors

The significant visitors to flowers of *E. muellerana* varied during the course of the flowering season (Table 2). Stigma contact during feeding was used as an indication of vector status, and only *bona fide* vectors are included on the table.

Dipteran species *(Helina* sp. *and Syrphus damastar)* and wasps (Tiphiidae sp.) were dominant early in the flowering season. Hymenoptera, chiefly the bee *Homalictus,* of which two species were identified, were the most common visitors during the middle of the season, while at

the end of the flowering season beetles, chiefly *Mordella* sp. and *Eleale* sp. were by far the most frequent visitors.

Robbers

Several small (<3mm) dipteran species appeared to be feeding on nectar without contacting the stigma. Detailed observations of a single inflorescence for two half-hour periods showed that during 35 visits of these insects (Ephyridae, Empididae, *Sciara* sp.) no stigma contact occurred. It is possible that the hoverfly, *Syrphus damaster,* should also be placed in this category as it has a smooth body and no pollen could be seen on specimens inspected with a hand lens in the field, but because of their large size and frequent stigma contact they will be considered as vectors until more information is available.

Table 1 **Insect visitors captured on flowers of *E. muellerana* throughout the flowering season.**

Diptera

Helina — 3 spp.
Rivellia
Sciaridae — 4 spp.
Empididae
Heleomyzidae
Syrphidae *(Syrphus damastar)*
Ephydridae
Muscidae — 2 spp. *(Fannia* sp. and *Musca* sp.)
Calliphoridae *(Calliphora* sp.)

Hymenoptera

Halictidae *(Homalictus punctatus* and *Homalictus dixonii)*
Tiphiidae *(Anthobosca* sp.)
Formicidae *(Camponotus* sp., *Heteroponera* sp.)
Pompilidae *(Episyron* sp.)
Pergidae *(Lophyrotoma* sp., *Cyanea* sp.)
Colletidae *(Euryglossa ephippiata, Leioproctus* (2 spp.), *Hylaeus* sp.)
Apidae *(Apis mellifera)*

Coleoptera

Curculionidae
Carabidae
Dermestidae — 2 spp.
Heteromastix sp.
Oroderes sp.
Mordellidae *(Mordella* sp.)
Cleridae — 2 spp.
Scarabaeidae — *(Phyllotocus* sp.)

Lepidoptera

Lycaenidae *(Jalmenus* sp.)
Amatidae *(Syntomis* sp.)
Nymphalidae

Bird Activity

Four species of bird were observed near the flowers in October. Two were honeyeaters (yellow-faced honeyeaters, *Meliphaga chrysops,* and red wattle bird, *Anthochaera carunculata)* and two were insectivores (scarlet robin, *Petroica multicolor* and yellow-tailed thornbill *Acanthiza chrysorrhoa).* All were feeding on insects around the flowers, not on nectar. While crashing into the flowers in their pursuit they probably effected some incidental pollination, but the visits of these birds were too few and sporadic to consider them as regular vectors.

Meliphaga chrysops and *Anthochaera carunculata* have both been recorded as nectar feeders on other species of *Eucalyptus* (Ford & Paton, 1977).

Later in the season no birds were observed at all in the flowering trees, despite the presence of a pair of yellow-faced honeyeaters noted attending a nest in shrubs only a few metres away.

Conclusion

The observations made during this season showed that flowers of *E. muellerana* were visited by a wide range of insects, but that the flowers did not appear to be a major food source for birds.

Because sample sizes were small and observations periods irregular it would be premature to draw firm conclusions about the relative importance of the different

Table 2: Insect pollen vectors observed visiting groups of 10-15 flowers of *E. muellerana* over the flowering period October 1983-January 1984.

Period of Observation	14.10.83-20.10.83	28.11.83-7.12.83	11.12.83-18.12.83	29.12.83-13.1.84
Duration of Observation (Hr)	8	5	3	6
Diptera				
Hoverfly *Syrphus damaster*	18	38	—	—
Bushfly *Helina* sp.	34	20	4	6
Blowfly *Calliphora sp.*	5	56	14	7
Other Diptera	6	3	—	3
Hymenoptera				
Tiphiidae sp.	16	—	1	2
Homalictus sp.	4	110	56	—
Colletidae sp.	—	6	6	18
Honeybee *Apis mellifera*	—	—	4	—
Formicidae	10	2	5	3
Other Hymenoptera	6	3	—	3
Coleoptera				
Pin-tailed beetles *Mordella* sp.	—	—	8	98
Eleale sp. Weevil	—	—	20	45
Curculionidae sp.	2	—	—	—
Other Coleoptera	7	—	—	16
Lepidoptera				
Nymphalidae	—	—	4	10
Lycaenidae	—	—	5	15

visitors as pollinators of this species. Nevertheless the study demonstrated that visiting insects *could* be categorised as: 1) nectar thieves which made no stigma contact; 2) taxa which may effect pollination but which are present in low number and hence do not make a major contribution to pollen transfer; 3) and those which were both effective and of high population density. Furthermore the identity of effective pollinators may vary significantly over time, and we should consider *E. muellerana* as being pollinated by a suite of native bees, flies and beetles.

Potential for pollination by a variety of different insects may well be of considerable adaptive advantage where climate is erratic and flowering not very predictable, as pointed out by Ford *et al.* (1979).

Acknowledgements

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Naturalist Reviews

A number of useful Australian field guides have been recently published which are cheap (under $20), locally relevant and probably most importantly, are accurate.

"A Guide to the Freshwater Fish of Victoria" by Philip Cadwallader and Gary Backhouse ($13.50; Victorian Government Printer) is a handy guide to our State's freshwater fish written by two officers from the Fisheries and Wildlife Division. A small but wide ranging introduction covers Victoria's inland waters, the impact that humans have had on native fish, collecting and photographing fish, fish parasites and the structure and classification of fish. The guide then gives details of each known freshwater Victorian species — a full description (including common and scientific names), a distribution map and notes on behaviour, food, breeding and value to man. With an easy to use key to the relevant families (complete with glossary), a reference list, index and 58 colour photographs, the book will prove highly useful to naturalist, field biologists and anglers.

The South Australian Government Printer has recently published two handbooks to marine fauna and flora *("Marine Invertebrates of Southern Australia. Pt I"* ed. by S. Shepherd and I. Thomas and *"The Marine Benthic Flora of Southern Australia"* by H. Womersley). These constitute two publications in the continuing series of handbooks on the flora and fauna of South Australia which can be obtained from the State Information Centre, Grenfell Centre Plaza, 25 Grenfell Street, Adelaide, S.A. 5000.

Both books have introductory chapters on the ecology of the environments studied. The fauna handbook has information on the marine environment and food webs (listing the types of feeding used by invertebrates in their different habitats); the flora guide on the other hand, has chapters on local distribution of marine flora, collecting and preserving marine plants, the history of studies of southern Australian marine algae, and the ecology and biogeography of marine plants in this region. The major parts of these books deal with descriptions of the species (in some cases higher taxons) of animals and plants found around coastal, southern Australia. Excellent keys are provided, although non-biologists will certainly have to refer to the extensive glossaries when using them. Each of the handbooks is accompanied by com-

prehensive bibliographies, colour plates and an index. Excellent value at $17 (or $21 on plastic paper) each.

"*The Oxford Guide to Mammals of Australia*" by J. Mary Taylor (Oxford University Press, $11.50) has been described by its author as the first "to present within one cover a brief description of every genus of land and marine mammal native to Australia. It is written as an introductory pocket-sized guide for use in the bush, at zoos, in museums, and on any other occasion where convenient and compact reference to the mammals of Australia may be needed." Thus it is not strictly a field guide to species in Australia — and hence the back cover's advertising it as "an indispensable guide and reference for . . . anyone who has ever wanted to identify that possum in the park" is quite erroneous. I am certain these words are not the author's! The guide does, however, give useful descriptions of each genus of native mammal — whether a naturalist, student or field biologist wanting to know the identity of an observed mammal would be satisfied with this, I am not certain.

Bearing such a deficiency in mind, the book still has some highly commendable features. One is the nomenclature used: the author is one of the growing band who accept the Australian Mammal Society's recommendations for common names, and I make an earnest plea for people wishing to write about our mammals to do the same. The book is also very up to date: it thus includes the recent revisions of *Antechinus* and the erection of the genera *Dasykaluta, Parantechinus* and *Pseudantechinus;* it includes the name of the Victorian Ningaui *(N. yvonneae).* The book has a good index, a useful glossary and a list of recent books and periodicals which provide information on mammals. Minor deficiencies exist — some of the physiological descriptions are odd or wrong, e.g. "metabolic rates of marsupials are 30% lower than in eutherians", but it is probably only basal levels which are lower and 30% is a rough average only! If torpor is mentioned in the "habits" section for *Acrobates* and *Cercartetus,* then why is it not mentioned for *Antechinus, Sminthopsis, Dasycercus* and *Petaurus?* Finally I would like to have seen introduced species mentioned in this guide (as in Hyett and Shaw: *Australian Mammals. A Field Guide for New South Wales, Victoria, South Australia and Tasmania,* which for all its inadequacies, was a surprising omission from the list of references.)

A much publicised and understandably well-acclaimed guide is that by Barbara Triggs "*Mammal Tracks and Signs. A Field Guide For South-eastern Australia*" ($12.99 paperback, Oxford University Press). The problem with using Taylor's book is that obviously the actual mammal needs to be seen in order that it be identified; yet most of our Australian mammals are either nocturnal or crepuscular (active at dusk and dawn). Barbara Triggs is quite aware of this difficulty: "Although we may not see the animals themselves, the environment abounds with the signs of their activity, and much information can be gleaned from these signs. It is the purpose of this book to help you interpret these signs. Once a few essential facts have been learned, the only way to become skilful in 'reading' tracks or recognizing scats or interpreting evidence of animal activity of any kind is to go out and observe." This then is an identification guide to help survey mammals by their indirect signs, namely tracks, scats, shelters, skulls and behavioural signs (e.g. the classical triangular cuts in the bark of food trees made by Yellow-bellied Gliders.) The back cover claims the book is "an indispensable fieldguide and reference for every naturalist, professional and amateur, of all ages". I could not agree more!

— **R. Wallis**

General Meeting
Monday, 13th August

Silence was observed on the recent passing of Jack Wilson, an active member of the Day and Botany Groups.

Honorary membership was awarded to Thomas Keith Slatter on completion of 40 years with the Club. Mr. Slatter was unable to attend the meeting.

Speaker for the evening was Charles Meredith from Monash University who spoke on various facets of the natural history of Wyperfeld National Park particularly in relation to the effects of fire. Charlie was, at one stage, employed by the National Parks Service in such a study in the north-west of the State.

Slides were shown of the different vegetation types within the Park, viz. mallee (different types, related to soil type), heathland and woodland — and short and long-term effects of the fire were shown. Towards the centre of the Park is a heathland which has not been exposed to fire for some time. Consequently it is not as floristically rich as the heathland on the western side of the park and such things as native Callitris pines are now emerging. Callitris is extremely sensitive to fire and killed outright very easily. Somewhat ironically, there is a particularly rich regeneration of Callitris pines in the ash bed left by a burnt pine. In *Callitris verrucosa* heavy seedfall occurs a week after fire.

Rabbit and kangaroo grazing is a problem in some areas, particularly in regard to regeneration. One slide displayed one means of getting around this — it showed a *Callitris preissii* growing up through a Triodia! Triodia, incidentally, burns very fiercely, being full of volatile oils. They are also home to a lot of reptiles such as *Amphibolurus fordi* which can survive fire in burrows as little as five centimetres deep. Larger reptiles such as the Stumpy tail lizard (*Trachydosaurus rugosus*) aren't so lucky and suffer heavy mortalities.

Fire signals a fresh start for some organisms. There is a heavy regeneration of herbs, plants that are usually not common in such habitats.

An interesting phenomenon of fires in this area which Charlie encountered, is the long lines of unburnt vegetation which occur inbetween burnt areas, the result of a meeting of two fire fronts.

Conservation: Malcolm Turner outlined several current conservation issues for the benefit of those present, viz.

Alpine area — Government under pressure from local interest groups not to accept LCC's proposed recommendations.

Murray Valley — LCC report has been released.

Long Forest area, near Melton — proposals for an area of this to be subdivided.

Grampians National Park — National Parks Service is producing a draft management plan. To this end they have published an inventory of resources and uses of the Park.

Exhibits: Four stereo microscopes displayed the finer details of various flower heads while under the high power microscope we saw nitrogen-fixing bacteria from the root nodules of clover.

A series of slides of Victorian sea-slugs from the Museum of Victoria's forthcoming slide reference collection was shown, illustrating a diverse range of species ranging from 10 centimetres to some several millimetres in length.

Nature Notes: There were reports of four cuckoo-shrikes in a garden at East Bentleigh, a Wombat at Mt. Baw Baw, and, from the recent Mammal Survey Group camp to Dolly Creek, Black Rat, Koala, Brushtail Possum, Swamp Wallaby and Eastern Grey Kangaroo.

At Seaford a White-browed Scrub-wren was observed building a nest in a pot-plant on a verandah.

General Meeting
Monday, 10th September

Topic for the evening was a Groups' discussion on regeneration after fire, particularly in regard to the February 1983 fires.

Barbara Wilson, from Deakin University, spoke on the post-fire regeneration and recolonisation of small mammals at Anglesea, a study she is currently engaged in.

Fortuitously, small mammal surveys were carried out in this area before the February '83 fires and thus provided the basis for a study of the effects of bushfire on small mammal populations. Of 12 species of small mammal recorded before the fire only one, the New-Holland Mouse (*Pseudomys novaehollandiae*) has been captured since the fire. Other notable features included large capture rates of the House Mouse (*Mus musculus*), in burnt and partially burnt sites, and the low numbers of rats in burnt sites. At some sites there was a dramatic decline in species' numbers, including local extinctions, e.g. from 6 (pre-fire) to zero (post-fire) species and from 9 to 3 species. The large numbers of *Mus* is in agreement with previous post-fire studies, or studies after clearing, mining, etc. In these studies *Mus* was an early colonist with numbers increasing rapidly within a year after the disturbance followed by an equally rapid decline in the following two years.

Ilma Dunn, from the Botany Group, detailed observations she has made on revegetation at Courtney's Road, South Belgrave. A comprehensive month by month rundown on the appearance of species was presented, accompanied by slides for each species.

Ilma first visited the area 8 weeks after the February '83 fire, to find new growth sprouting from the trunks of Eucaplypts and also the first appearance of a fungus and orchid (Parsons Band). Interestingly Parsons Band Orchid didn't appear this year. There were a number of plants that Ilma observed for the first time at Courney's road, viz. *Cynoglossum suaveolens* (Sweet Hound's tongue), and, in January this year, the Horned Orchid *Orthocerus strictum*. The revitalisation of the bush was highlighted with slides of over 70 species, many of these orchids. As well as herbs, woody shrubs such as Grass trees (*Xanthorrhoea minor*) and *Acacia myrtifolia* have also reappeared. Ilma said that areas of the forest formely thick with overgrowth (Hakea, Dusty Miller, etc.), were opened up (to the extreme) by the fire but even now are returning to the former situation.

Conservation: Malcolm Turner announced that the LCC's Murray Valley descriptive report has been released and that public comment is invited. Very little crown land (9%) remains in this area. Of this only a very small area has been zoned for conservation. The main part of Barmah forest is still to be cut for timber and grazed.

Still on the subject of the LCC the Club is preparing a submission on the North-east study area, and any assistance in this regard would be appreciated.

Exhibits: Several microscopes displayed pond life from Rosebud (showing the single-celled *Stentor riger*), and a series of geological sections. A specimen of Aire 'fern' was exhibited. It was explained that this is actually a marine hydroid that is stained green and sold under the guise of a fern. Other marine polyzoa could be seen growing on the lower part of the stem. A drop of water from a bottle of soaked lawnclippings revealed the presence of bacteria.

From the recent Mammal Survey Group camp to Whroo — Costerfield

State Forest near Rushworth came a specimen of *Sminthopsis murina* (Common Dunnart) a mouse-sized marsupial that lives under rocks, logs etc. and feeds on insects. This animal was found under a piece of tin and was caught by hand.

Other exhibits were a box of mounted insects, a bird's nest from Rushworth lined with sheepswool, and fungi from Courtney's road.

Nature Notes: There were a number of reports as follows:
— small hakeas flowering at Courtney's road
— twelve rosellas at Springvale
— Noisy Miners and Magpies dive-bombing ducks
— alpine tree frogs collected from the Snowy plains are now croaking in a backyard in North Balwyn.
— from the same Mammal Survey Group mentioned above it was reported that 60 species of birds, two lizards and one snake were also recorded.

Excursion to King Island — 12-19 January, 1984

BY LILIAN KIRK*

Climbing Mt. Everest? Rafting the Franklin? Well, perhaps the FNCV members who returned from King Island on 19 January, 1984 were not quite adequate for such exertions, but they certainly felt that their excursion had been adventurous as well as informative. Credit for this can be given to the thorough and imaginative planning of Os. and Eulalie Brewster, who were staying on the island with their son, David. Eulalie acted as guide each day, and the excursion was also "King Island re-visited" for Paul Barnett, now living in the Otways, but ready with information gained during his 30 years sojourn on the island.

School bus driver Geoff, who met the group of thirty at the airport on 12 January, and waited each day with unruffled patience for perambulating naturalists, explained that time didn't mean much on King Island. "About then" was accurate enough. Perhaps that explained why members of the local field naturalists' club, and other residents, gave the impression that they had all the time in the world to help the visitors with information, and transport them in 4WD vehicles to interesting places beyond the reach of the bus.

All those mentioned may be sure that their help was really appreciated by those who know that the difference between a "tour" and an "excursion" lies in the quality of local assistance.

As far as the author knows, no botanical discoveries were made on this occasion, and the botanical list published in 1972 is still adequate. However the omens were favourable for the bird observers, and the attached list is longer than that of 1972.

The theme of the excursion was set by a swamp harrier *(Circus aeruginosus)* which rose beside the runway as the first Fokker Friendship trundled in, and showed, by its display of planing and hovering, a complete disdain for the clumsy works of man. During the week, wherever we went, a Swamp Harrier would be hunting nearby, and it was definitely the "bird of the island". Masked lapwings *(Vanellus miles)* were numerous enough to remind us that we were on Tasmanian territory, but here they did not take the place of the mainland magpie, as the White-backed magpie *(Gymnorhina tibicon,* race *hypoleuca)* has been successfully introduced to King Island, in contrast to other parts of Tasmania.

Thursday 12 January. After settling in at the Boomerang Motel, members made their way — more or less directly! — to Kelp Industries' factory. Here, Mr Frank Cullen delighted us with his detailed description of the process, and his enthusiasm for an industry which does not decimate resources or pollute the earth, but uses the "fallen leaves of the sea" in the service of mankind. We began at the outdoor drying racks, where it was evident that the kelp, while all classified as Bull Kelp *(Durvillea potatorum),* comes in two different forms, with broad and narrow leaves. Then the drying and pulverising processes were followed until, in granular form, the kelp was packed for export to Alginate Industries Ltd., of Scotland.

From there, the party visited King Island's museum, formerly the residence attached to the neighbouring Currie Lighthouse, to learn the

* 5 Lewis Street, Donald, Victoria, 3480.

background history of the island. This history has been dominated by its inhospitable coast and latitude, demonstrated by the relics of wrecks which surround it, and by the difficulties of life for the hunters who decimated the seals, sea elephants and kangaroos, and the early settlers who tried to farm the mineral-deficient soil. The addition of phosphates, copper and cobalt has been found necessary.

Plants recorded in the Currie area by our photographers included *Olearia glutinosa, Leucopogon parviflorus, Alyxia buxifolia, Olearia ramulosa* and *Carpobrotus rossi*, and these plants were also characteristic of the dunes in other parts of the island. Typical King Island birds, the White-fronted chat *(Ephthianura albifrons)*, and Richard's pipit *(Anthus novaeseelandiae)*, were also evident on the golf links, and at the coastline an Australian gannet *(Morus serrator)* was seen. At the sea's edge, fragments of wrecks lay among the jagged, dark rocks, a complex of granite and strongly metamorphised sediments, coarsely grained.

Friday 13 January. No ill luck greeted the day, as we drove to the Forestry Reserve on Mt. Stanley. Officials explained that the stands of *Pinus radiata* and hardwoods were originally intended to supply the island's needs for building and fencing. These can now be more than adequately met, but transport costs and lack of markets make it impossible to expand the industry.

A walk through natural forest, including the three native eucalypts, *E. viminalis, E. ovata* and *E. globulus; Leptospermum scoparium, Phebalium squameum, Eleocarpus cyaneus* and *Monotoca scoparia,* brought us to see some specimens of *Cyathea australis* of unusual height. Then we saw, in a tall *E. viminalis*, the nest of a White-breasted sea-eagle *(Haliaeetus leucogaster)* with a well-grown brown youngster watching us in turn. In this vicinity the birdo's had excellent views of the Tasmanian indigenes, Green rosella *(Platycercus caledonicus)* and Tasmanian thornbill *(Acanthiza ewingii)*. Back at the Forestry barbecue area for lunch, we were entertained by a pair of grey fantails *(Rhipidura fuliginosa)* with two delightful tail-less, but very acrobatic young. Other birds in this area included Grey shrike-thrush *(Colluricincla harmonica)*, Superb blue wrens *(Malurus cyaneus)* and New Holland honeyeater *(Phylidonyris novaehollandiae)*. Photographs were taken of plants in flower, *Elaeocarpus reticulatus, Microtis unifolia* and *Billardiera longiflora.* Very few orchids were found in flower, as the island had experienced a dry spell.

From here Mr Dennis Whitehurch, Vice-principal of Currie School, took the birdo's in his borrowed landrover to the mouth of the Sea Elephant River. It runs for a distance parallel to the sea and protected from it by sand dunes, and here is the haunt of large numbers of wading birds. We saw Pied oystercatchers *(Haematopus longirostris);* Red-capped dotterels *(Charadrius ruficapillus)*, Ruddy turnstones *(Arenaria interpres);* Greenshank *(Tringa nebularia)*, Red-necked stint *(Calidris ruficollis)*, Curlew sandpiper *(Calidris ferruginea)*, as well as the common sight of Black swans *(Cygnus atratus)*. When the bus arrived, Dennis then ferried the rest of the party along the edge of the wet sand to enjoy the sight of so many waders. Strong winds, to be typical of the whole week, battered us as we roamed the dunes, finding fragments of whale vertebrae and photographing *Senecio odoratus, Samolus repens, Calytrix microphylla, Leptospermum scoparium* and *Pelargonium australe.*

That evening, our party joined members of the King Island Field Naturalists' Club in a delicious smorgasbord dinner at the Chinese restaurant in Currie.

Saturday 14 January. For the rest of our stay, we were constantly reminded by the very strong winds that we were in the latitude of the Roaring Forties. These winds had fanned a grass and peat fire on the farm of our bus driver, Geoff, so while waiting for him, we investigated Currie harbour, where a Pied cormorant *(Phalacrocorax melanoleucos)* posed for photographs, and Musk ducks *(Biziura lobata)* were seen swimming.

Eventually we reached the town of Grassy, which until recently had a population of 800, serving the busy scheelite mines. Now, scheelite is sold from mines in China at a price which makes the local product no longer viable. The Dolphin mine is closed, and Bold Head mine, after a holiday closure for five weeks, is expected to maintain only 70 employees, the barest minimum to keep the mine machinery functioning. This of course, repeats the story of tin and rutile mining on King Island, as these have completely ceased because their operations are no longer economic.

We drove along the breakwater which was made from mine over-burden to shelter the loading pier. Along the breakwater could be

found pieces of quartzite studded with black garnets, and in the piled rocks at the end of the breakwater were nests of Little penguin *(Eudyptula minor),* of which we saw only occasional downy glimpses. We searched the turbulent sea with our binoculars, rewarded by a distant sighting of a Black-browed albatross *(Diomedea melanophris)* riding the waves.

Leaving Grassy, we drove up Red Hut road to a bush-lined area for lunch. Our photographer recorded *Boronia aenemonifolia, Disphyma australe* and *Billardiera cymosa.* Here, too, was a good area for birds, and we heard and saw the indigenous race *humilis* of the White-browed scrub-wren *(Sericornis frontalis).*

On the way back to Currie we visited Paul Barnett's old home, now occupied by the Siefferts, who were happy to let us wander through the huge garden where New Holland honeyeaters and Dusky robins *(Melanodryas vittata),* both with half-grown young, enjoyed the shelter of many kinds of trees and shrubs, native and exotic, many of which were flowering.

Sunday 15 January. Two excursions were planned, separating the "energetic" from the Others. The latter group drove in the bus to City of Melbourne Bay, where they found much of interest on the rocky shore. Seaweeds, rosy pink and yellow, and quartzites and conglomerates, also in a great variety of colours, rewarded searches on the pebbly shore. The edge of a rocky cliff revealed trunks of Tasmanian celery-top pine *(Athrotaxis selaginoides),* which once grew on the Bass Strait land-mass and now, buried by glacial action, are in the process of calcification. A stingray was seen swimming, and the son of a King Island naturalist found the skeleton of a seahorse.

Meanwhile, some of the Victorian party and some locals, ages ranging from 5 years to old enough to know better, scaled the side of the Yarra Creek Gorge to the creek-bed, for a 4-hour "walk" that could not really be described by that leisurely term. Crossing and recrossing the creek on stones slippery with lichen — and sometimes entering it; edging round the cliff faces with meagre-finger-and-toe holds, and clambering, sliding and heaving over, under and between huge rocks of strange shapes, the energetic ones occasionally could enjoy the sight of the beautiful creek, eddying over its stones and edged with ferns, prominent among which were *Todea barbara, Cyathea australis, Dicksonia antarctica, Asplenium flabbelifolium* and *Blechnum nudum.* Also, the Scrub nettle, *(Urtica incisa)* and *Cyathodes oxycedrus* were quickly recognised by touch!

All the "energetic" ones arrived safely at City of Melbourne Bay, where they saw *Elaeocarpus reticulatus* with flowers and berries, and an unusual fungus.

In the evening, rain began as the party made its way to Currie High School for a barbecue, and the local helpers once more came to our aid. The barbecue was followed by an evening of interesting slides, shown by local and Victorian naturalists.

Monday 16 January, fortunately was fine, though again windy, as we took the northern road to Cape Wickham. On the way, a call was made at the Cheese Factory, where Heather showed us its operation and told the interesting story of its development, from a co-operative butter factory which failed, to a privately-owned concern which supplies immature cheese to Kraft for further processing. It has now accumulated sufficient capital to accept a contract for a special matured spicy cheese, of which small quantities only are required.

A little farther down the road came another stop, unscheduled this time as a bus tyre punctured. Making hay with or without sunshine is no trouble for Field Nats, and we scattered up the road, lined with stands of *Melaleuca ericifolia,* in the midst of which we saw Dusky robins, thornbills *(Acanthiza ewingii),* Olive whistler *(Pachycephala olivacea),* and were entertained by a territorial conflict between honeyeaters *Phylidonyris novaehollandiae* and the yellow-throated *Lichenostomus flavicollis.* Californian quail were heard among the bracken fern *(Peteridium esulentum)* but could not be seen.

On wheels again, we reached Cape Wickham lighthouse, tallest in the Southern hemisphere, and sheltered among *Leptospermum scoparium* and *Myoporium insulare* from almost gale-force winds, to eat our lunch. Hardy beachcombers brought back pieces of rock veined with tourmalines.

Later, we visited Lake Martha Lavinia, and along bush trails saw and photographed *Swainsona lessertifolia,* which is poisonous to stock; the pygmy sundew *(Drosera pygmaea); Lobelia alata* and *Dianella caerulea,* while we hoped, in vain, to see Yellow wattle-bird *(Anthochaera paradoxa)* among the flowers of *Banksia marginata,* which here has shorter foliage than

in Victoria. By the lake's edge were the delicate, shivering bells of *Utricularia lateriflolia*, which looked much more like "Fairies' aprons" than "tiny bladderwort"! The bones of a Black swan reminded us that King Island sometimes has an open season for these birds, because they have increased to such numbers that they are considered a menace to farmers. It was interesting to see that the water of Lake Martha Lavinia, though quite fresh, was a brown, peaty colour, stained by the decaying *Leptospermum scoparium*, through which its waters drain.

On the way back we had yet another example of local kindness, when Mrs Cathy Lott gave us afternoon tea in her home and told us interesting stories of the Cape Wickham lighthouse, and of the early settlers, the Graves and Hickmott families.

Tuesday 17 January took us to the Ettrick River mouth area. Here dotterels *(Charadrius ruficapillus)* ran along the shore, and interesting shells were found in rock pools. Marie Allender found a soft, spherical brown object which appeared to be a group of polyps, and has been tentatively identified as *Alcyonarium*.

We left the bus and were taken, seated on hay bales in landrovers, truck and trailer, to Surprise Bay. Here we sympathised with the efforts of a group of holiday-makers to refloat their boat, which had slipped its moorings during the night's high winds, and beached on the shore. We were also interested to see a large crayfish *(Jasus lalandei)* which they had caught.

Our "off-road" transport then took us to the "Calcified Forest", where bleached skeletons of past forest remnants stand on the sand dunes. It was interesting to note, beside the track, that all three species of King Island eucalypts grow in mallee form in the sandy soil.

Still more narrow were the tracks through which we next were taken to the cliffs above Seal Rocks, and in the open trailers, heads had to be kept well down as the tea-tree whipped over them. The air was fragrant with the scent of the musk daisy-bush *(Olearia argophylla)* and others among the thick, low vegetation on the cliff top were *Leucopogon australia* and *parviflora, Olearia glutinosa, Senecio lautus*, and *Calytrix tetragona*, which was flowering. There too was the "Melbourne Bitter bush", with its tin flowers!

Some of the party climbed down the cliffs to see the "Champagne Pool" and the Natural Arch; others, deterred by the high wind, stared fixedly through binoculars at rocks where two seals were thought to have been seen — but regretfully concluded that they could not be guaranteed, as the sea foamed in and out of the shining rocks.

However, there were several sightings of Bennett's wallabies *(Macropus rufogrisea)* beside the track, and also of pheasants *(Phasianus colchichus)* — a resplendent cock, and a hen with chicks.

Wednesday 18 January, our last day, had been promised as "a day for the birdo's" and we headed for Yellow Rock, where the original Field Naturalists' excursion had made camp in 1887. On the creek were many swans with young of various sizes, and among them, Black duck *(Anas superciliosa)* and Chestnut teal *(Anas castanea)*, plus lapwings, magpies, chats, fantails and Little ravens *(Corvus mellori)* along the banks. Skylarks *(Alauda arvensis)* sang overhead, and we watched a pair of turkeys *(Meleagris gallopavo)*, demonstrating that they are really wild birds on King Island, as they concealed themselves, then slipped away among the reeds. Flocks of turkeys had been seen several times in paddocks, during the week. As we lunched, we had our first sight for the trip of the indigenous Black currawong *(Strepera fuliginosa)*. Then, walking along the beautiful sandy beach, where remains of the paddle steamer "Shannon" could be seen, we watched a red-capped dotterel returning to her eggs in an unusually sheltered spot under a small stick. Along the beach were hooded dotterels *(Charadrius rubicollis)* with young, pied oyster-catchers and red-necked stints *(Caladris ruficollis)*. A number of wallabies was seen among the cliff-top vegetation.

The next stop was at Tatham's Lagoon, where, among swans, Black duck and Chestnut teal we found Hoary-headed grebe *(Podiceps poliocephalus)* and, at last, Eastern swamphen *(Porphyrio porphyrio)*. Beside this lagoon grew unusually large trees of *Bursaria spinosa* in fragrant flower.

Our way finally led to David Brewster's property, and Dennis joined us as we stalked beside the waterholes, hoping to fill the last spaces on our bird list. At last appeared the Nankeen night heron *(Nycticorax caledonicus)*, but still the yellow wattlebird and Californian quail eluded us — "but you should have been here yesterday!" We were solaced with a cuppa, while watching Blue wrens feeding their young in a nest beside the back door.

We returned to pack our belongings, and Dorothy and Pat had just folded away the bird

list, ready to go to dinner, when a knock heralded Dennis, with landrover parked by the door. "Come!" he said. "We'll still find the wattlebird and the quail!" So they careered down tracks "never cross'd save by folk that are lost" until, there were three yellow wattlebirds *(Anthochaera paradoxa)* in one tree. No quail — but no matter!

Finally, as we sat over our dinner, looking out to the twilit sky, a Nankeen kestrel *(Falco cenchroides)* appeared, just outside the window, and hovered, watching for prey. We could watch every movement of wing, tail and head as it hung upon the wind. It was a perfect end to the excursion.

Bird List: FNCV Excursion-King Island 12-19 January 1984

Hoary-headed Grebe *(Podiceps poliocephalus)*
Little Penguin *(Eudyptula minor)*
Black-browed Albatross *(Diomedea melanophris)*
Short-tailed Shearwater *(Puffinus tenuirostris)*
Australian Gannet *(Morus serrator)*
Black-faced Cormorant *(Phalacrocorax fuscescens)*
Little Pied Cormorant *(Phalacrocorax melanoleucos)*
Little Black Cormorant *(Phalacrocorax sulcirostris)*
White-faced Heron *(Ardea novaehollandiae)*
Nankeen Night-heron *(Nycticorax caledonicus)*
Black Swan *(Cygnus atratus)* — (plus young)
Black Duck *(Anas superciliosa)*
Chestnut Teal *(Anas castanea)*
Musk Duck *(Biziura lobata)*
White-breasted Sea-eagle *(Haliaeetus leucogaster)* — with nest and young
Swamp Harrier *(Circus aeruginosus)*
Brown Falcon *(Falco berigora)*
Nankeen Kestrel *(Falco cenchroides)*
Turkey *(Meleagris gallopavo)* — with young
Ring-necked Pheasant *(Phasianus colchichus)* — with young
Swamphen *(Porphyrio porphyrio)*
Pied Oystercatcher *(Haematopus longirostris)* — with young
Masked Plover *(Vanellus miles)*
Eastern Golden Plover *(Pluvialis dominica)*
Hooded Dotterel *(Charadrius rubricollis)* — with young
Red-capped Dotterel *(Charadrius ruficapillus)* — with nest and eggs
Ruddy Turnstone *(Arenaria interpres)*
Greenshank *(Tringa nebularia)*
Red-necked Stint *(Calidris ruficollis)*
Curlew Sandpiper *(Calidris ferruginea)*
Silver Gull *(Larus novaehollandiae)*
Pacific gull *(Larus pacificus)*
Crested Tern *(Sterna bergii)*
Brush Bronzewing *(Phaps elegans)*
Green Rosella *(Platycercus caledonicus)**
Common Skylark *(Alauda arvensis)*
Welcome Swallow *(Hirundo neoxena)*
Richard's Pipit *(Anthus novaeseelandiae)*
Blackbird *(Turdus merula)*
Dusky Robin *(Melanodryas vittata)* — with young*
Olive Whistler *(Pachycephala olivacea)*
Golden Whistler *(Pachycephala pectoralis)*
Grey Shrike-thrush *(Colluricincla harmonica)*
Satin Flycatcher *(Myagra cyanoleuca)*
Grey Fantail *(Rhipidura fuliginosa)* — with young
Superb Blue Wren *(Malurus cyaneus)* — with young
Tasmanian Scrub-wren *(Sericornis frontalis,* race *humilis)**
Scrub Tit *(Sericornis magnus)**
Tasmanian Thornbill *(Acanthiza ewingii)**
Yellow Wattlebird *(Anthochaera paradoxa)**
Yellow-throated Honeyeater *(Lichenostomus flavicollis)**
Strong-billed Honeyeater *(Melithreptus validirostris)**
Crescent Honeyeater *(Phylidonyris pyrrhoptera)*
New Holland Honeyeater *(Phylidonyris novaehollandiae)* — with young
White-fronted Chat *(Ephthianura albifrons)*
Grey-breasted White-eye *(Zosterops lateralis)*
European Goldfinch *(Carduelis carduelis)*
European Greenfinch *(Carduelis chloris)*
House Sparrow *(Passer domesticus)*
Common Starling *(Sturnus vulgaris)*
Black Currawong *(Strepera fulginosa)*
Australian Magpie *(Gymnorhina tibicen,* race *hypoleuca)*
Little Raven *(Corvus mellori)*

* Indigenous to Tasmania and Bass Strait Islands.

REFERENCE

Pizzey, G. (1980). *A field guide to the Birds of Australia.* Collins, Sydney.

Banksia Atlas

Following the success of the Bird Atlas, a Banksia Atlas is proposed. To launch the project an information session will be held in the hall of the National Herbarium, Birdwood Avenue, South Yarra on Wednesday, 19th December, 1984 at 8.00 p.m. Anne Taylor from Western Australia, the Director of the project, will be present. Site record sheets, an instruction book and supplementary field guide will be available. If you require further information, contact Alf Salkin (ph. 232 6213).

Country, Junior and Interstate Clubs

This list is published as a reference guide, and to facilitate co-operation between the Clubs. Every effort has been made to ensure that it is accurate. We apologise for any errors and omissions which may have occurred. Clubs marked with an asterisk are affiliated to the F.N.C.V.

Albury-Wodonga Field Naturalists Club
Secretary: Mrs Anne Davies, P.O. Box 223, Lavington 2641.

Anglesea and Airey's Inlet Society for the Preservation of Flora and Fauna
Secretary: Ms Mary White, P.O. Box 12, Anglesea 3230.

* Bairnsdale Field Naturalists Club
Secretary: Mrs Eileen McCoy, 28 Gould Street, Bairnsdale 3875.

* Ballarat Field Naturalists Club
Secretary: Miss Joanne Binns, 12 Pleasant Street, Ballarat South 3350.

* Benalla Field Naturalists Club
President: Mr Alan Monger, P.O. Box 458, Benalla 3672.

Bendigo Field Naturalists Club
Secretary: Mr P. N. Ellis, P.O. Box 396, Bendigo 3550.

Casterton Field Naturalists Club
Secretary: Mr K. A. Barker, 44 Jackson Street, Casterton 3311.

Castlemaine Field Naturalists Club
Secretary: Mrs Beris Perry, C/- P.O. Guildford 3451.

Colac Field Naturalists Club
Secretary: Miss L. Cotter, Apollo Bay Road, Yeodine 3249.

Creswick Field Naturalists Club
Secretary: Mrs J. King, Church Street, Creswick 3663.

* Donald History and Natural History Group
Secretary: Mrs. M. I. Rye, C/- P.O. Box 111, Donald 3480.

* Geelong Field Naturalists Club
Secretary: Miss D. Primrose, Wallington, via Geelong 3221.

* Hamilton Field Naturalists Club
Secretary: Mrs R. McGregor, P.O. Box 591, Hamilton 3300.

* Horsham Field Naturalists Club
Secretary: Mrs Coral Smith, P.O. Box 824, Horsham 3400.

Kinglake Field Naturalists Club
Secretary: Miss Karma Hastwell, Post Office, Kinglake 3763.

* Latrobe Valley Field Naturalists Club
Secretary: Mrs J. Peterson, 14 Barry Street, Morwell 3840.

Leongatha Field Naturalists Club
Secretary: Mrs Ellen Lyndon, 7 Steele Street, Leongatha 3953.

Macedon Range Conservation Society
Secretary: Mrs Janet Stanley, C/- Box 31, Riddells Creek, 3431.

* Maryborough Field Naturalists Club
Secretary: Mr D. Nichols, P.O. Box 76, Avoca 3467.

Mid-Murray Field Naturalists Inc.
Secretary: Miss G. Willoughby, 22 Gray Street, Nyah West 3595.

* Montmorency Field Naturalists Club
Secretary: Mrs Elaine Braby, 21 Cromwell Street, Eltham 3095.

* Mt. Martha Field Naturalists Club
Secretary: Mrs Betty Wadsworth, 15 Hubert Street, Mt. Martha 3934.

North-East Field Naturalists Club
President: Mr Eric Jackson, 9 Brodie Street, Wangaratta 3677.

Pascoe Vale Field Naturalists Club
Secretary: Mr Alan Thompson, 106 Derby Street, Pascoe Vale South 3044.

* Peninsula Field Naturalists Club
Secretary: Mr A. Walker, 637 Nepean Highway, Frankston 3199.

* Portland Field Naturalists Club
Secretary: Mrs Dorothy Woolcock, P.O. Box 470, Portland 3305.

* Ringwood Field Naturalists Club
Secretary: Ms Judith Cooke, Box 418, Ringwood 3134.

Robinvale Field Naturalists Club
Secretary: Mr. J. Curr, 13 Alexander Street, Robinvale 3380.

St. Arnaud Field Naturalists Club
Secretary: Ms Gwen Webb, P.O. Box 128, St. Arnaud 3478.

Sale Field Naturalists Club
Secretary: Mrs G. Finlay, P.O. Box 802, Sale 3850.

South Gippsland Conservation Society
Secretary: Mrs Clyve Excell, Farmers Road, Dumbalk North, 3956.

* Stawell Field Naturalists Club
Secretary: Mrs J. Hughes, 9 Oriental Street, Stawell 3380.

Sunraysia Naturalists Research Trust
Secretary: Mr. E. Lawron, P.O. Box 763, Mildura 3500.

Timboon Field Naturalists Club
Secretary: Mr Arthur Bryant, Curdie Vale Road, Timboon 3268.

Traralgon Field Naturalists Club
Secretary: Mr J. Scott, 48 Gilmour Street, Traralgon 3844.

Upper Goulburn Field Naturalists Club
Secretary: Mrs D. Wells, 19 Johnston Street, Alexandra 3714.

Wannon Conservation Society
Secretary: Mrs Hilary Turner, Box 177, Coleraine 3315.

Warragul Field Naturalists Club
Secretary: Mr J. Brooks, 3 Nobel Street, Warragul 3820.

Warrnambool Field Naturalists Club
Secretary: Mrs Peg Baulch, R.M.B. 7580, Hawkesdale 3287.

Wimmera Field Naturalists Club
Secretary: Miss A. Jordan, "Lister Vale", R.S.D. Kiata, via Nhill 3418.

Yea Field Naturalists Club
Secretary: Mrs Peg Lade, 'Glentannar', Highlands, via Seymour 3660.

* Victorian Field Naturalists Club Association
Secretary: Dr Elizabeth K. Turner, 13 Barnool Avenue, Kew 3101.

Western Victorian Field Naturalists Clubs Association
Secretary: Mr E. Perkins, P.O. Box 212, Castlemaine 3450.

Junior Clubs

The Basin Junior Field Naturalists Club
Secretary: Ms Shelley Brown, C/- P.O. Box 2, The Basin 3154.

Hawthorn Junior Field Naturalists Club
Secretary: Mr Damien Cummins, 10/24 Kensington Road, South Yarra 3141.

Montmorency Junior Field Naturalists Club
Secretary: Mrs Elaine Braby, 21 Cromwell Street, Eltham 3095.

Interstate Clubs

Field Naturalists Society of South Australia
C/- 70 Valley View Drive, Highbury, South Australia 5089.

Queensland Naturalists Club
G.P.O. Box 1220, Brisbane, Qld. 4001.

Tasmanian Field Naturalists Club
P.O. Box 68A, Hobart, Tas. 7001.

West Australian Naturalists Club
Naturalists Hall, 63-65 Merriwa Street, Nedlands, W.A. 6009.

Our Kinglake Property

The Field Naturalists Club of Victoria owns a property at Kinglake and it is quite possible that members who have joined in the last few years may not be aware that we own a piece of natural bushland not very far from Melbourne.

The property was bequeathed to the Club in perpetuity by a Mr. Harold Clarke Frahm who died in July 1974. During his lifetime Mr. Frahm had found much enjoyment from the natural beauty of his property and left it to our Club so that future generations could find pleasure and relaxation.

The land is situated about 3 kilometres north-east of the Kinglake Hotel which is located on the main Whittlesea/Kinglake/Healesville Road at the corner of Eucalyptus Road (a road to Glenburn).

The map illustrates the location — a good guide is to turn at the School corner.

The block has an area of 10 acres and is approx. 440 metres long and 110 metres wide. About 80% of the area is well covered with Eucalyptus with an interesting mixed understorey typical of the area. The remaining area at the northern end (through the gate) is more open and had been used for grazing but is now restoring itself to a more natural habitat.

The entrance is from McMahons Road and has a locked gate — there is a round yellow disc on the gate post. The gate is opened on days when FNCV excursions are held at the block but for those who visit the area in small groups or individually, there is a Pedestrian Entrance beside the gate, and a short walk up the track reveals a hut, BBQ area (much care required in dry weather), and toilets.

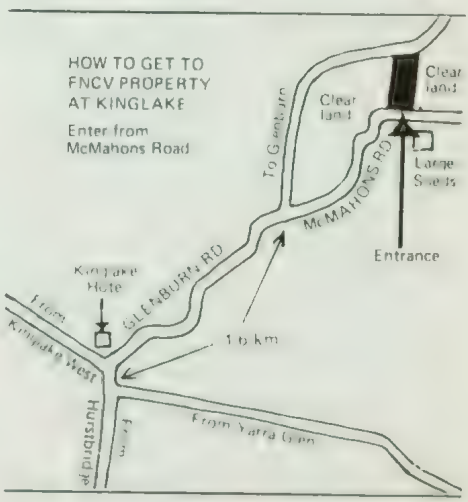
Also starting just to the right of the main gate is a nature trail which winds its way to the rear of the block. There is a smaller trail from the Hut along the West side of the land. Look for white pointed trail markers.

It is worth noting that the block is only about 2 kilometres from the start of the Island Creek/Andrew Hill portion of the Kinglake National Park. Details of this area are available from National Parks Service, East Melbourne and Kinglake.

It is planned to have a "Kinglake Day" perhaps twice a year when it is hoped that a number of members and friends could attend at the same time and enjoy this area and also meet other FNCV members. It would be an opportunity to give some thought to the development of ideas which could lead to a greater appreciation and use of the area by our members.

With this in mind it is proposed that Sunday, October 21 be a Kinglake Day and the gate will open at 10.00 a.m. As there is often need for a little clearing and raking around the hut area (for protection) it is suggested for those inclined that they bring a few basic tools.

As a matter of interest we pay Shire of Yea rates at $250 per annum for this property and apart from the aspect of enjoying our piece of native bushland it is desirable that members get some benefit from a Club asset which does cost some money to maintain.



(Continued from inside front cover).

At the National Herbarium, Birdwood Avenue, South Yarra at 8.00 p.m.

Botany Group — Second Thursday

Thursday, 11th October. "Heaths" — Hilary Weatherhead.

Thursday, 8th November. "Kew Gardens and Europe" — Rex Filson.

Thursday, 13th December. Members night.

Geology Group — First Wednesday

Wednesday, 8th November. Members night.

Wednesday, 5th December. Christmas meeting.

Mammal Survey Group — First Tuesday

Tuesday, 30th October. "Bushfire Ecology" — David Cheal, *note change of speaker.* (This is the November meeting).

Tuesday, 4th December. To be announced.

Microscopy Group — Third Wednesday

Wednesday, 17th October. Microscopy for laboratory technicians — Mr. Robert Graham.

Wednesday, 21st November. Cinema through the microscope — Dr. E. Peters.

Microscopical Group Annual Report 1983-84.

Our membership has remained virtually constant during the year, though several inquiries were received as a result of advertisements in The Age Weekender, and there was a marked increase in attendance by visitors at the March meeting held at the School of Botany, Melbourne University, when Mr K. Blaze spoke on Diatoms.

This year was the 110th anniversary of the founding of the Microscopical Society of Victoria, and at the July meeting Mr R. D. Graham gave a review of the Society one hundred years ago. Other speakers during the year included Dr. E. Peters, Dr. R. Hamond, Mr D. Wentworth and Mr H. Bishop. The death of Mr Paul Genery in September was a great loss to the Group, and we appreciated the courtesy of Mrs Genery and Mr. M. Genery in allowing us to show some of Paul's movies through the microscope at the November meeting. Mrs Genery has also donated to the Club many of her husband's slides of pond life, and other equipment.

There have been a number of acquisitions to the library:

Fresh water Copepods from Victoria, Southern Victoria, by G. O. Sars, 1908(in English, Xerox copy).

Reference list of Copepoda, by Dr. R. Hamond (appended to minutes of meeting No. 313).

Linnaen Society of N.S.W., bound volumes.

C.S.I.R.O. Scientific and common names of insects found in Australia, 1980.

Cheshire's "APERTOMETER" cavity slide Refractometer, and Abbe's test diagram for APLANTISM, donated by Dr R. Hamond. A collection of books were donated by Mrs E. J. Le Maistre, and a slide collection was received from Mr John Strong.

The Group has liaised with Royal Society and the Microscopical Society of Australia (Sydney).

E. C. Graham
Hon. Secretary

Field Naturalists Club of Victoria

Established 1880

Registered Office: FNCV, c - National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron:
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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 10th December, 8.00 p.m.

Extraordinary meeting: Motion — That the North-East Field Naturalists Club be elected as an affiliated club of the Field Naturalists Club of Victoria.

Paul Peake — "Owls".

Honorary membership will be awarded to Ken J. Simpendorfer.

Monday, 11th February, 8.00 p.m.

Dr Neil Hallam. The biology of Macquarie Island.

FNCV EXCURSIONS

Friday — Friday, 18th-25th January. Cann River. This excursion will be based at Cann River with day trips to places such as Mallacoota, and nearby National Parks, etc. Accommodation has been booked for D.B.B. The coach will leave Flinders Street by the Gas and Fuel building at 8.00 a.m. Bring a picnic lunch. Cost of excursion is $350, and this should reach the Excursion Secretary Miss Allender by December 20th.

Saturday — Monday, 26th-28th January. Alpine camp out with John Milligan and Dr. Jim Willis. Details from John Milligan, phone A.H. 557 3509.

Sunday, 3rd February. Insect excursion. Leader: Peter Carwardine. Probable area Mt. Disappointment. The coach will leave Batman Avenue at 9.30 a.m. Fare $9.00. Bring a picnic lunch.

GROUP EXCURSIONS

All FNCV members, and visitors, are invited to attend Group Excursions.

Botany Group.

Saturday, 23rd February, Lake Mountain.

Mammal Survey Group.

December 26th-January 1st. Grampians National Park.

February 9th-10th. Braeside Metropolitan Park.

GROUP MEETINGS

FNCV members, and visitors, are invited to attend any Group Meeting.

Day Group — Third Thursday.

No Meetings in December or January.

Thursday, 21st February. Visit to Craft Cottage then guided walk on Australian Aboriginal Plant Resources. Meet at Botanic Gardens Kiosk at 11.30 a.m. Leader: Mr. A. Blackburn 379 8960.

Thursday, 21st March. Port Melbourne — Albert Park Beach Walk. Leader: Mr. D. E. McInnes 211 2427. At the National Herbarium, Birdwood Avenue, South Yarra at 8.00 p.m.

Botany Group — Second Thursday

Thursday, 13th December. Members night.

No January meeting.

Thursday, 14th February. "Alpine Flowers" — Andy Blackburn.

Geology Group — First Wednesday

No January meeting.

Wednesday, 6th February. Holiday reminiscences.

Mammal Survey Group — First Tuesday

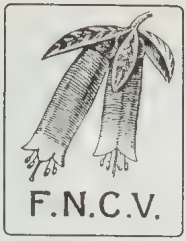
No January meeting.

Tuesday, 5th February. Members night.

Microscopy Group — Third Wednesday

Wednesday, 16th January. Microscopy through the video screen — Mr. Robert Graham.

Wednesday, 20th February. Pollen under the microscope — Mr. U. Bates.



The Victorian Naturalist

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Cover Illustration: Halosarcia halocnemoides dwarf shrubland, Pt. Wilson. See paper on page 234.

Sidas of the Mildura and Surrounding Districts

By J. H. Browne*

The genus *Sida* is a member of the Malvaceae (the Mallow family) which includes garden plants such as *Hibiscus* and *Abutilon*. Australia-wide there are 35 native species of *Sida* and 5 introduced ones. The genus is especially prominent in arid areas. Outside Australia, Sidas are found in the warmer regions of both hemispheres but especially in America. *S. leprosa* var *hederacea*, a native of America, has been found in a local irrigated vineyard at Irymple (Fig. 1). Its ability to grow from small pieces of root as well as from seed may mean that eradication will be difficult.

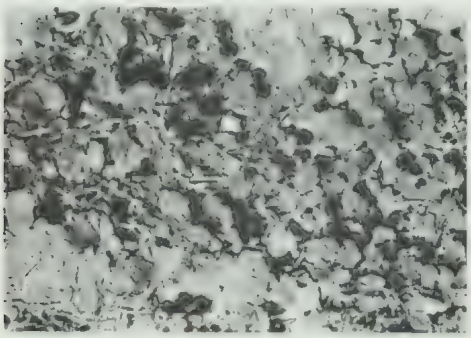

Fig. 1. *Sida leprosa* var. *hederacea* from roadside near vineyard in Belar Avenue, 3 km SE of Irymple.

The aim of the present paper is to present information on the description, identification, distribution, habitat and conservation of the species of *Sida* present in the Shire of Mildura and the N.S.W. Irrigation Area adjacent to it on the opposite side of the Murray River. This includes the whole NW corner of Victoria as far south as the southern edge of the Hattah-Kulkyne National Park.

Mature fruiting material is necessary for positive identification because several species are morphologically variable. Growth, flowering and fruiting usually occur in the latter part of spring. Then the plants usually die back to a woody rootstock in the hot dry conditions, leaving just a few small shoots and leaves.

The plants are quick to respond to good summer rain, the vigorous growth that follows making these occasions possibly the best time to identify them. With the exception of those found on the river floodplain, the species dealt with here can occur plentifully following clearing, soil disturbance, and sometimes fire, presumably from soil-stored seed.

Seven native taxa are found in this district, of which one is currently regarded as a variety and the rest as species. Although also found in other states, three of these are confined in Victoria to this area (viz. *S. ammophila*, *S.* sp. aff. *corrugata* and *S. fibulifera*). These three have been registered as Rare and Endangered Victorian Plants by the Botany Department at La Trobe University. All *Sidas* native to Victoria have been found in the present study area. *S. rhombifolia*, only found further south, is regarded as having been introduced there from New South Wales and Queensland. The seven native taxa are dealt with in turn below.

***Sida ammophila* Sand Sida** (Fig. 2)

Stems slender, erect, up to about 40 cm long; branchlets usually small and divaricate. Leaves up to 5 cm long, smaller (about 1 cm long) and narrower at the top of the stem; both surfaces with greyish felt-like stellate hairs, whiter on the smaller leaves. A rusty tinge is present on both the young stems and leaves under good growing conditions; the margin of the leaves is narrowly toothed. Flowers borne singly (rarely in pairs) in the leaf axil. Pedicel up to 15 cm long, with felt-like hairs. Calyx lobes acute, with felt-like stellate hairs. Fruit made up of 5 fruitlets (mericarps).

*Fitzroy Avenue, Red Cliffs, Victoria, 3496

Fig. 2. *Sida ammophila*. Calder Highway, Sunny Cliffs, 3 km north of Red Cliffs.

S. ammophila is mainly a roadside plant in the irrigation area. It also occurs in one local reserve and in the Hattah/Kulkyne National Park. It is found in the sandy to loamy red soils in association with a number of small trees and shrubs such as *Dodonaea, Cassia, Acacia bivenosa, A. colletioides* and often with *Sida fibulifera*. It has not been found where mallee eucalypts dominate.

The biggest Victorian plants occur in a stand of about 250 plants on a roadside at Colignan, occuring with *Myriocephalus stuartii, Vittadinia cervicularis* and *V. dissecta*. Covering a greater area and with a larger number of plants are those growing with *S. fibulifera* at the Red Cliffs Scenic Reserve, in an area that should be conservable if care is taken. All other stands are smaller and decreasing, namely:— roadside just east of Yelta; near the Merbein Cemetery and Brickworks; railway reserve at the McEdwards St. railway crossing; roadside at the north end of the Mildura Cemetery and nearby near the river on the golf course and both sides of the Calder Highway at Sunny Cliffs 3kms north of Red Cliffs. *S. fibulifera* also occurs in the first three localities. The single stand known in the Hattah/Kulkyne National Park is on a dune on the south side of Lake Hattah. Forty plants of *S. ammophila* were counted there in April, 1979, but the only plants found since were two in March 1984. This decline is thought to be due to drought and kangaroo grazing.

***Sida corrugata* Variable Sida** (Fig. 3)

Variable, low growing sub-shrub with prostrate or procumbent stems up to 35 cm long. Leaves orbicular, ovate to ovate-lanceolate, crenate, often ± cordate at the base, greenish-white below. Although many flowers are borne singly, several in a leaf axil can be found occasionally on any given plant. Pedicels to 15mm long. Calyx lobes obtuse, fruit 5 mm in diameter with 6-7 fruitlets, wrinkled on the back.

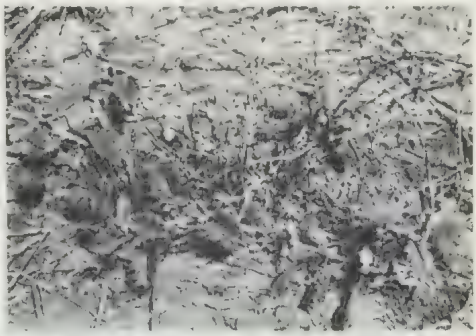

Fig. 3. *Sida corrugata*. Coerner of Cureton Avenue and Psyche Bend track 4.5 km ESE of Irymple.

Although this species is recorded in Victoria for grids A, B, C, G, M and R, these records also include *S. corrugata* var *angustifolia* (Willis, 1972), which is dealt with separately below. Only plants from a single distinctive stand, located on private property and an adjoining road reserve at the junction of Cureton Avenue and a track to Psyche Bend on the Murray River have been identified as *S. corrugata* by the National Herbarium of New South Wales. *Sida corrugata* here has a thick woody rootstock and stems. The younger growth and leaves are greyer in appearance (due to more stallate hairs) than those I have noticed on plants along the Wimmera River near and north of Dimboola and along the Yarriambiack and Tyrrell Creeks.

Habitat notes are difficult with just one stand. This one has formerly been cleared and is now open grassland. The site was sometimes cultivated in the past as a means of summer fire control. Soil is red loam to

clay loam on the lower part of a slope, with some limestone rubble. *S. fibulifera, S. intricata* and a few *S. trichopoda* are also present. *Acacia victoriae* is the common plant in the nearby uncleared land.

Sida corrugata* var. *angusifolia (Fig. 4)

Stems erect or spreading, to about 20cm high. Leaves ovate-lanceolate, to 3cm long, wider in the lower half, sometimes cordate at the base, paler underneath, becoming narrower and smaller towards the end of the stems and often with a reddish tinge when the plant is dry. Flowers always borne singly in the leaf axils. Calyx lobes slightly incurved, giving a 5-angled appearance just before flowering, becoming broad and obtuse when in fruit. Fruitlets 6-9, the same as *S. corrugata*.

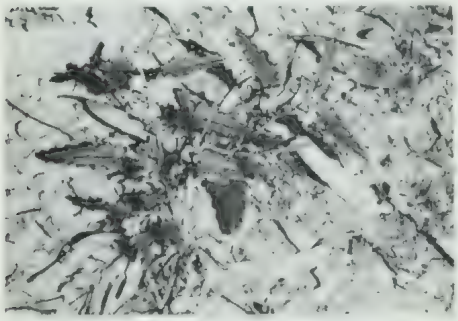

Fig. 4. *Sida corrugata* var. *angustifolia*. Bottle Bend Reserved Forerst east of Red Cliffs

The plants referred to by this name are called *S. corrugata* narrow-leafed form by the National Herbarium of New South Wales. Willis (1972) stated that the typical variety and var. *angustifolia* occur together. This is not true of the present study area. *S.* var. *angustifolia* occurs along the Murray River from the upstream end of the Murray/Kulkyne Park to the Lindsay Island and Lake Wallawalla areas in the far NW corner of the state.

Habitat is the sandy clay loams of the *Eucalyptus largiflorens* floodplain, usually in the areas at about the height of the higher floods. It is less commonly associated with *Eucalyptus camaldulensis* and rare in the heavier clays.

***Sida* sp. aff. *corrugata* Limestone Sida** (Fig. 5)

Small, low-growing, spreading sub-shrub to 30cm across, rootstock usually woody. Leaves ovate to ovate-lanceolate, crenate on the edge, 1-2 cm long, grey on top, yellowish/green underneath. Flowers single from the leaf axils. Pedicels short, about 3-10 mm long. Calyx lobes acuminate. Fruit depressed-globular with 5-6 fruitlets.

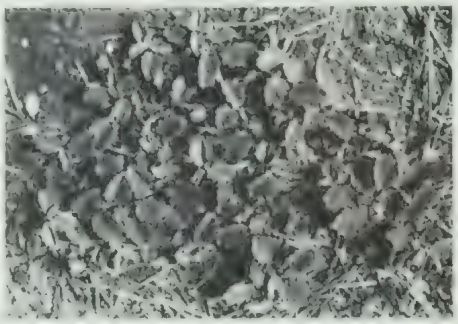

Fig. 5. Limestone Sida, Cardross Sports Ground.

This is an undescribed species referred to and illustrated in Cunningham *et al.* (1981) as Limestone Sida. Only two stands are known in Victoria, one on the Cardross Sports Ground, 4.5km north west of Red Cliffs and the other on a road reserve and adjoining cleared private property at the corner of 20th Street and Koorlong Avenue, Cardross. Both stands are endangered. A small stand has also been found near Gol Gol on the N.S.W. side of the river.

An uncommon or little-known plant of the arid areas, it is also referred to as "*Sida* species C" in the N.S.W. Census (Jacobs and Pickard 1981) and corresponds with "*Sida* species B" in Flora of Central Australia (Jessop 1981). The National Herbarium of N.S.W., who confirmed the identification, had only 3 collections from N.S.W. at that time. They were from Tibooburra, Broken Hill and Lake Victoria, about 65 km west of Wentworth.

Its occurrence in Central Australia is described as infrequent.

The plants resemble some *S. corrugata* plants, but they are usually smaller and the leaves are much greyer on top and yellowish/green underneath. They also differ from *S. corrugata* in nearly always having a single flower from the leaf axil, except for several plants on the sports ground (where they receive some extra irrigation) which have two flowers per axil. The pedicels, described by the National Herbarium of N.S.W. as only 3mm long, are longer than that here in normal conditions. Under some irrigation, they can become up to 10mm long. The calyx lobes are more acute than *S. corrugata* and the fruit usually has 5 fruitlets.

The two Victorian stands are both from areas cleared of their original vegetation. Soil at the Sports Ground is a reddish loam with limestone rubble. Uncleared land on the opposite side of the road has *Eucalyptus gracilis* as the dominant plant. At the second Victorian stand, the soil is sandier but it still has limestone rubble. The small N.S.W. one at Gol Gol is in a low open area, with *Eucaluptus gracilis* and *Acacia victoriae* nearby.

***Sida fibulifera* Pin Sida** (Fig. 6)

Stems vary from prostrate to more or less erect, 30cm or more long. Leaves ovate-oblong to linear-lanceolate, up to 4cm long, sparsely or densely stellate-hairy on both surfaces, crenate on the edge. Stipules long, persistent, pin-like and conspicuous. Flowers cymose, 3-7 or sometimes solitary, on long slender pedicels, calyx lobes obtuse, downy with stellate hairs, fruitlets 7, pubescent.

Apart from a recent find in a small area of the Murray River floodplain in the Hattah/Kulkyne National Park, they are confined in Victoria to the Sunraysia irrigation area. They are also found in the N.S.W. side of the Murray River and in all other mainland states. Within 15 known stands, two of which are quite large, they are the most common *Sida* here in the red soils. Despite this, the species is very badly reserved in Victoria at present. With less than 30 plants known in the Hattah/Kulkyne National Park, the only other site where long-term conservation could be readily implemented is at Red Cliffs Scenic Reserve where a large stand is present.

They are found in the flat, open areas of red loam with *Eucalyptus gracilis* and on the sandy loams with *Dodonaea, Cassia* and the small *Acacias*. Some of the latter areas may be regrowth after the original clearing of the land. One N.S.W. stand is in a low area that was formerly a large *Acacia loderi* stand, another is in open areas of *Acacia victoriae*. Those found in the Hattah/Kulkyne National Park are with open *Eucalyptus largiflorens* in the sandy clay loam of the floodplain. They are smaller, prostrate plants, greyer in colour than those found on the red soils. In nearly all stands, one or more of the other *Sidas* are with them.

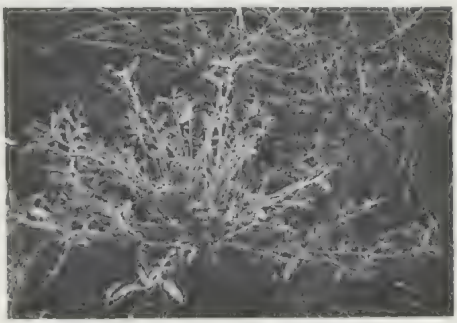

Fig. 6. *Sida fibulifera*. Corner of Cureton Avenue and Psyche Bend track, 4.5 km ESE of Irymple.

***Sida intricata* Twiggy Sida** (Fig. 7)

Small, spindly shrub to 30cm high, sometimes almost leafless, branches in mature plants spine-like at the end. Leaves small, elliptical to ovate, 2-8mm long. Flowers small, borne singly in the leaf axils. Fruit of 4mm diameter with 5 fruitlets.

This is a common *Sida* in the area and is recorded for the Victorian grids A, B, L and M and all mainland states. It differs from other *Sidas* in that it is a small,

Fig. 7. *Sida intricata*. A small plant. Corner of Cureton Avenue and Psyche Bend track 4.5 km ESE of Irymple

woody shrub that can grow to 30cm, but is usually much less.

A plant of open areas, sometimes found as single plants. It mainly occurs on the lower, heavier soils, although some can be found in sandy loams. It can also be found in the sandy clay loams of the *Eucalyptus largiflorens* floodplain. The plant association varies with the soils, but nearly all stands of the other *Sida* species would include some *S. intricata* with or near them.

***Sida trichopoda* Narrow-leaf Sida** (Fig. 8)

Erect subshrub with several stems to 40cm high. Leaves with sparse stellate hairs, ovate-lanceolate to linear-oblong, 1-3cm long. Flowers borne singly in the leaf axils, on slender pedicels 2-4cm long, articulate below the calyx. Fruit 5-7mm in diameter with usually 7 fruitlets downy with stellate hairs.

This is recorded from grids A, C, L and M and from South Australia, New South Wales, Queensland and Central Australia. Until some fairly recent finds, not a great deal seems to be known about it in this district. It is not mentioned by any of the earlier botanical collectors, although it is recorded for the Hattah/Kulkyne National Park. It has been found there recently along with a small number in the old floodplain west of Merbein. The greatest number found in this district up until now are in the Bottle Bend Reserved Forest, just east of Red Cliffs.

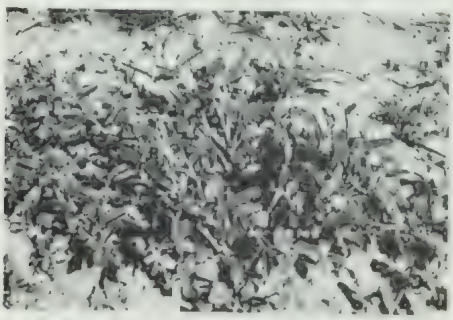

Fig. 8. *Sida trichopoda*. Bottle Bend Reserved Forest east of Red Cliffs

Mainly because the stellate hairs are sparse, the plants are greener in colour than other local *Sidas*. It is possibly the quickest *Sida* to respond to good summer rain. This seems to be the main growing period, the plants dying back to small ones or just rootstocks when it is dry. On the floodplain, they are spreading or semi-erect and can grow to 40cm but usually much less. The few found on red loam are first erect, then trailing with a stem in one case 60cm long.

The main stands here, of thousands of plants, are on the floodplain in the heavier clay with *Muehlenbeckia cunninghamii*. Another stand is with *Eucalyptus largiflorens* and *S. corrugata* var *angustifolia*. Those west of Merbein are also in clayey soil, in this case with *Pachycornia triandra* as the dominant plant. The small stands found in red loam are on land that had been cleared. They are with *S. fibulifera* and have the same plant association.

Acknowledgements

I wish to thank Dr. R. F. Parsons of the Botany Department, La Trobe University, Bundoora; Teresa James and Dr. Barbara Briggs of the Royal Botanic Gardens, Sydney and Mr. Stephen Forbes of the National Herbarium, Melbourne, for their help in identification and their comments and Mrs. Margaret Corrick, National Herbarium, Melbourne, who compiled the key.

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Appendix

A key to the genus *Sida* L. in Victoria*

1. Calyx with 10 prominently raised nerves; mericarps† reticulate on the sides and two-awned ..... *S. rhombifolia* L.
   Calyx without prominent nerves; mericarps honeycombed on the sides and without awns 2
2. Leaves reniform, mostly broader than long, petals creamy-buff, stellate-hairy on the outside, twice the length of the calyx. .....
   S. leprosa (Orteg.) Schum.
   var. *hederacea* (Douglas ex Hook.) Schum.
   Leaves sometimes ± orbicular but not reniform, mostly longer than broad, petals yellow, not, or only slightly exceeding the calyx 3
3. Calyx lobes acuminate, often with subulate points 4
   Calyx lobes obtuse, acute or scarcely acuminate 5
4. Leaves linear-oblong, grey, flowers solitary, occasionally cymose .....
   S. ammophila F. Muell. ex. J. H. Willis
   Leaves ovate-lanceolate, strongly discolorous, grey above, green yellow below, calyx shortly stellate-pubescent ..... *Sida* sp. aff. *corrugata* "Limestone Sida"
5. Flowers solitary, or rarely in pairs 6
   Flowers several, clustered or cymose 9
6. Leaves narrowly linear-oblong, grey; mericarps 5. .....
   S. ammophila F. Muell. ex. J. H. Willis
   Leaves linear-lanceolate, ovate or orbicular, mericarps 5-10 7
7. Leaves ovate to orbicular, usually cordate (to lanceolate-cordate in *S. corrugata* var. *angustifolia* Benth) 8
   Leaves linear-lanceolate to ovate-lanceolate, never cordate; mericarps c. 7 .....
   S. trichopoda F. Muell.
8. Leaves ovate, less than 1 cm long (often deciduous or absent); brances sometimes ending in spines; mericarps 5. ..... *S. intricata* F. Muell.
   Leaves lanceolate to orbicular 1-2.5 cm long; branches not ending in spines; mericarps 6-10 ..... *S. corrugata* Lindley (including var. *angustifolia* Benth).
9. Flowers several, clustered in each axil; mericarps 6-10 .... *S. corrugata* Lindley
   Flowers cymose; mericarps 5 or 7 10
10. Leaves linear-lanceolate; mericarps 7; fruit 4-5 mm diam .....
    S. fibulifera Lindley
    Leaves narrow linear-oblong; mericarps 5; fruit 5 mm diam .....
    S. ammophila F.Muell. ex. J. H. Willis

*Key adapted from Cunningham *et al.* (1981) and Willis (1972).
†The term fruitlet in the text is used as a synonym for mericarp.

The Grey Glasswort (*Halosarcia halocnemoides*) in Coastal Victoria and Some Implications for the Orange-bellied Parrot

BY J. Z. YUGOVIC*

Introduction

The Grey Glasswort (*Halosarcia halocnemoides* (Nees) P. G. Wilson) is known to occur in association with salt lakes in north-west Victoria (Browne, 1982), but has been overlooked in coastal Victoria. This paper reports the recent discovery of the species in the salt marshes of the western Port Phillip region where it had been considered to be a stunted form of the relatively widespread Black-seeded Glasswort (*H. pergranulata* (J. M. Black) P. G. Wilson). This has important implications for the ecology of the endangered Orange-bellied Parrot (*Neophema chrysogaster*).

Taxonomy

H. halocnemoides is a member of the Chenopodiaceae tribe Salicornieae. The Salicornieae ('samphires' or 'glassworts') are leafless herbs and shrubs with succulent, segmented branches and embedded flowers and fruits. They characterise the vegetation of salt marshes and salt lakes throughout Australia and much of the world. In 1980 P. G. Wilson published a comprehensive review of the Australian Salicornieae in which the three former varieties of *Arthrocnemum halocnemoides* Nees were raised to specific rank in the genus *Halosarcia*. All three species occur in north-west Victoria, but only two, *H. pergranulata* subsp. *pergranulata* and *H. Halocnemoides* subsp. *halocnemoides* occur in coastal Victoria.

H. halocnemoides subsp. *halocnemoides* is a polymorphic taxon including several geographic variants (Wilson, 1980). In coastal Victoria it is a small, decumbent, much-branched subshrub 5-15 cm high. It has short fertile spikes 0.5-2.0 cm. in length, bearing brown to reddish-brown seed. Individual plants tend to die back in the centre with maturity, leaving rings of foliage connected by prostrate branches. *H. pergranulata* subsp. *pergranulata* is a larger, erect or ascending (rarely decumbent) shrub 20-80 cm high. It has long, conspicuous fertile spikes 1-5 cm in length, bearing dark reddish-brown to black seed. Differences in sculpture on the seed testa are also of diagnostic importance (see Wilson (1980) for details). Interspecific hybridization may occur, as plants of intermediate morphology (usually exhibiting deformities and sterility of flowers) have been reported (Wilson, 1980). However suspected instances of this in coastal Victoria are rare.

In the field, *H. halocnemoides* is readily distinguished from *H. pergranulata* by its small size and compact, decumbent habit. A parapatric relationship is usually evident in localities where the species coincide, with *H. halocnemoides* occupying relatively elevated sites landward of *H. pergranulata*. Species boundaries are often sharply defined.

Habitat

H. halocnemoides is adapted to withstand prolonged periods of hypersalinity. It typically occurs at the rear of salt marshes on seasonally hypersaline supratidal flats where it forms dwarf shrubland or dwarf open-shrubland (*sensu* Specht, 1981). Stands are frequently interspersed with salt pans. The species is flooded only rarely during unusually high spring tides. Without regular tidal inundation to reduce the

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effects of evapotranspiration, soil salinities reach extreme values in summer, and surface salt crystallization may occur. In winter and spring, salinities are relatively low due to dilution by precipitation. The species appears to be independent of soil type. It occurs on a wide range of substrates, including clay, siliceous sand, and fossil shell beds.

The association formed by this species is visually distinctive with individual plants regularly spaced and usually separated by bare ground (Fig. 1). Pure stands are common, particularly on sites adjacent to salt pans. Away from pans, *Sarcocornia quinqueflora* (Beaded Glasswort), *Disphyma clavellatum* (Rounded Noon-flower) and *Frankenia pauciflora* (Southern Sea-heath) usually provide sparse cover. On relatively elevated (ecotonal) sites, *S. quinqueflora* and *F. pauciflora* may co-dominate with *H. halocnemoides* and diminutive annuals and ephemerals can be seasonally prolific. Information on the ecology and distribution of *H. halocnemoides* at Pt. Wilson is given by Carr (1982) under the headings 'Open *Halosarcia pergranulata* shrubland' and 'shrubland herbfield mosaic'.

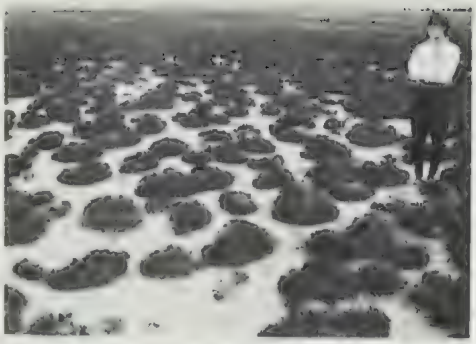

Fig. 1. *Halosarcia halocnemoides* dwarf shrubland, Pt. Wilson.

Geographic Range

H. halocnemoides is widely distributed in mainland Australia in association with inland salt lakes and coastal salt marshes. The Port Phillip occurrence is geographically isolated and is at the southern limit of the species' range. The nearest record of the species is from north-west Victoria, while the nearest coastal record is from near Beachport, South Australia (Wilson, 1980). Subspecies *halocnemoides* is the only subspecies in south-east Australia. Bridgewater (1981) published a comprehensive account of coastal salt marshes in southern Australia in which *H. halocnemoides* was recognised as the dominant within a distinct association (termed Halosarcietum halocnemoidis) recorded for western South Australia and southern Western Australia. The Port Phillip occurrence is a significant range extension for this association.

In coastal Victoria, *H. halocnemoides* is restricted to salt marshes in the western Port Phillip region. The author has collected the species at nine localities in the region, from Murtnagurt Swamp near Barwon Heads to RAAF Lake near Pt. Cook (Fig. 2). There are two erroneous records for salt marshes east of Port Phillip. A specimen at the National Herbarium, MEL 628807, originally labelled as *H. halocnemoides* and collected from Quail Island, Westernport Bay, proved to be *Sarcocornia blackiana* upon examination. Similarly, MEL 1508830, collected from Lake Reeve, Gippsland Lakes, is in fact *H. pergranulata*. Wilson's (1980) distribution map of *H. halocnemoides* subsp. *halocnemoides* shows one Victorian coastal occurrence for northern Port Phillip Bay, a record which was incorporated by Beauglehole (1980), but ommitted from his later publication (1983). The origin and reliability of this record is in doubt however, as no voucher specimen or details accompanying the record can be located (P. G. Wilson, *pers. comm.*).

In Victoria, *H. halocnemoides* is limited to areas receiving an annual rainfall of less than 650 mm. The western Port Phillip region has the driest climate in coastal Victoria due to its location within the rainshadow of the Otway Ranges. The

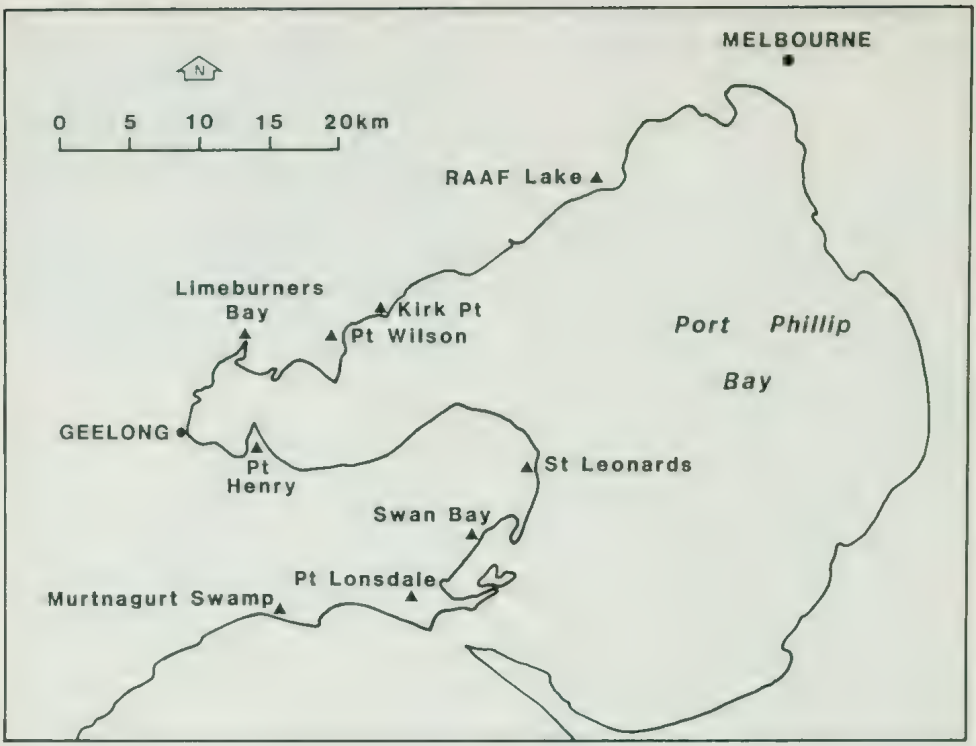

Fig. 2. Recorded occurrences of *Halosarcia halocnemoides* in coastal Victoria.

mean annual rainfall at Pt. Wilson is 485 mm (Pt. Wilson Explosives Area, weather records) compared with Westernport Bay which receives about 800 mm. The low rainfall results in high evapotranspiration values, and ultimately produces the intensely hypersaline conditions with which *H. halocnemoides* is associated.

The distinctive *Halosarcia* spp. — dominated salt marshes of western Port Phillip Bay have been referred to as 'dry' salt marshes due to the region's dry climate (Barson and Calder, 1976). The term is also appropriate due to their situation at the rear of marshes where tidal inundation is infrequent. 'Wet' salt marsh, typified by *Sclerostegia arbuscula* — dominated associations, is the only form of salt marsh in high rainfall areas (such as at Westernport Bay), but also extends into drier areas where it forms a broad zone fringing dry salt marsh on sites receiving regular tidal inundation. Localities at which the wet and dry elements coincide contain the most structurally and floristically diverse salt marshes in Victoria.

Conservation Status

Prior to European settlement, *H. halocnemoides* shrubland appears to have been common at the rear of salt marshes in the western Port Phillip region. However the distribution and abundance of this association has been adversely affected by industrial, agricultural and residential development, and in particular by the construction of solar saltworks and shell-grit quarries. Whilst *H. halocnemoides* is naturally uncommon at some localities e.g. at St. Leonards, some populations are only relics of former large occurrences e.g. at Pt. Henry and Pt. Lonsdale. There may have been major occurrences close to Melbourne e.g. at Altona, but upper-level

salt marsh vegetation in this area has been virtually eliminated.

Five of the nine recorded occurrences of *H. halocnemoides* are located within biological reserves. Large populations (at least several hundred plants) occur at The Spit, Swan Bay and Limeburners Bay State Nature Reserves and are reasonably secure. Small, vulnerable populations (dozens of plants) occur at the Lake Connewarre State Game Reserve (Murtnagurt Swamp) and the St. Leonards State Nature Reserve. The largest and least disturbed population (thousands of plants, occupying approx. 20 ha) occurs at Pt. Wilson, mainly on private land owned by ICI Australia Ltd., but also extending onto The Spit State Nature Reserve, managed by the Victorian Fisheries and Wildlife Service. This occurrence was more extensive in the 1960s prior to the construction of sewage filtration paddocks and settling ponds on the adjacent Melbourne and Metropolitan Board of Works farm.

Only a small proportion of the original extent of *H. halocnemoides* shrubland in the western Port Phillip region has survived the development pressures of this century. Conservative management of this ecologically significant and once locally extensive association is required. Research into the autecology of *H. halocnemoides* is needed so that specific management guidelines for the species can be formulated.

Implications for the Orange-bellied Parrot

The presence of *H. halocnemoides* in the western Port Phillip region has important implications for the ecology of the endangered Orange-bellied Parrot.

The Orange-bellied Parrot (*Neophema chrysogaster*) is a very rare migratory parrot of coastal south-east Australia. It breeds in south-west Tasmania and migrates to the mainland to overwinter along the Victorian and South Australian coasts. The main aggregations occur in the salt marshes of western Port Phillip Bay (Brown and Wilson, 1982). The species was locally common last century but it has since declined and today fewer than 200 individuals survive. The reasons for decline have not been clear, although habitat destruction has been implicated (Brown and Wilson, 1982). There have been no complete explanations for the species' marked preference for the salt marshes of Port Phillip Bay over the more extensive salt marshes found elsewhere.

At Pt. Wilson, a detailed three-year study (1978-1980) of the ecology of the Orange-bellied Parrot has shown that the parrot utilises both wet and dry salt marsh as well as adjacent areas of exotic vegetation as winter habitat (Lane and Loyn, 1980; Chandler and Loyn, 1981; Loyn, Lane, Chandler and Carr, in prep.). The parrots feed on the seeds and flowers of a range of salt marsh plants (mainly Chenopodiaceae), supplemented at times by exotic species.

H. halocnemoides is an important food source from late April to mid August. In late autumn and early winter, it is mainly utilised when feeding areas in wet salt marsh containing the favoured *Sarcocornia quinqueflora* (Beaded Glasswort) are inundated by tides, or when sewage filtration paddocks in the adjacent MMBW farm containing *Chenopodium glaucum* (Glaucous Goosefoot) and the exotic *Atriplex hastata* (Hastate Orache) are flooded by irrigation. After *S. quinqueflora* loses seed in June/July there is evidently a general shortage of food until mid August when *Sclerostegia arbuscula* (Shrubby Glasswort) produces abundant seed. *H. halocnemoides* is considered to be an important back up food source during this transition period. *Halosarcia pergranulata* is rarely if ever utilised by the parrot. (R. Loyn *et al., in prep.*).

During the July/mid August period, Orange-bellied Parrots frequent the dry salt marsh at Pt. Wilson, feeding on *H. halocnemoides* and, in some years, on *Frankenia pauciflora*. The parrots also continue to feed in sewage filtration

paddocks on *C. glaucum* and *A. hastata*. The importance of the filtration paddocks in relation to the salt marsh varies from year to year, however there is evidence to suggest that salt marsh is preferred in years when good seed crops of *F. pauciflora* are produced (Loyn *et al., in prep.*). Whilst the filtration paddocks are completely artificial, they have, to some extent, offset the substantial loss of dry salt marsh that has occurred in the Pt. Wilson area (through conversion to sewage treatment works, salt evaporators, and an explosives reserve). It is likely that the parrots relied more heavily on dry salt marsh prior to its depletion.

A complete picture of the Orange-bellied Parrots' ecology prior to European settlement is impossible to reconstruct as there have been considerable changes in the vegetation of the region. However it is significant that the distribution and abundance of remnant *H. halocnemoides* in coastal Victoria coincides with the preferred overwintering habitat of the parrot. Indeed, the largest stands of *H. halocnemoides* occur at Pt. Wilson — the parrot's primary overwintering site. It is also significant that parrot numbers at Pt. Wilson reach a maximum during the period in which dry salt marsh is most frequently utilised, suggesting that food supplies elsewhere are limited at this time (Loyn *et al., in prep.*). Parrots start to disperse from the area when the relatively widespread *S. arbuscula* produces abundant seed in mid August. It appears that the Orange-bellied Parrot traditionally associated with *H. halocnemoides* salt marsh, probably because of its value in maintaining a continuity of food supply. The importance of this habitat type to the Orange-bellied Parrot at Pt. Wilson is emphasised by Loyn *et al.* (in prep.).

The decline of the Orange-bellied Parrot in Victoria appears to be related to the alteration and elimination of salt marshes in Port Phillip Bay for industrial, agricultural and residential development, commencing last century. Using a combination of geological maps, aerial photographs and field observations, the author estimates that there has been a 75-80% reduction in the total area of salt marsh from Melbourne to Pt. Lonsdale since European settlement. A similar pattern is evident in South Australia, where substantial areas of salt marsh have been destroyed (Roper, 1976). The Orange-bellied Parrot now persists in South Australia in very small numbers, feeding primarily on the exotic *Cakile maritima* (Sea Rocket), found in coastal dunes (Brown and Wilson, 1982). The extent to which the species utilised this habitat prior to the arrival of *C. maritima* is unknown.

Conclusion

The coastal salt marshes of the western Port Phillip region (Melbourne to Barwon Heads) are botanically diverse but have been poorly studied. They include a previously unreported association, *H. halocnemoides* dwarf shrubland, which is not found elsewhere along the Victorian coast. The Orange-bellied Parrot is closely associated with the salt marshes of this region probably because they provide a more reliable food supply than do less diverse salt marshes elsewhere.

Habitat destruction is clearly implicated in the decline of the parrot. The extent and condition of remaining habitat appears to be a major factor limiting potential population size. Substantial increases in Orange-bellied Parrot numbers are unlikely without a significant improvement in the food resources of the species. The future of the parrot depends on the sensitive management of the remaining habitat areas in Port Phillip Bay. The Victorian Fisheries and Wildlife Service has co-operated with the Tasmanian and South Australian National Parks and Wildlife Services in the preparation of a national conservation program for the species (Brown and Wilson, 1984).

Special conservation measures are required for the remaining areas of *H. halocnemoides* dwarf shrubland, not only because they provide a valuable link in the food supply of the Orange-bellied Parrot, but also because they are of considerable intrinsic scientific interest.

Acknowledgements

The author is very grateful to R. Loyn, B. Lane and C. Chandler for published and unpublished data on the ecology of the Orange-bellied Parrot at Pt. Wilson and to P. Wilson for taxonomic advice. R. Loyn, P Brown, P. Wilson, P. Menkhorst, W Chamley and J. Anderson helped improve the manuscript. J. Anderson provided assistance in the field. Fig. 2 was prepared by S. Pribble.

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ADDENDUM

Addendum to "Artificial Hybrids . . " paper by D. H. Ashton *Victorian Nat.* 101(5): 193-198. Fig. 2. Top Row: left to right — *E. regnans*; F_1; *E. baxteri*; Bottom Row: left to right — *E. regnans*; F_1; *E. obliqua.*

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Occurrence of Juvenile Weatherfish *Misgurnus anguillicaudatus* (Pisces: Cobitidae) in the Yarra River

By S. Allen*

Introduction

Weatherfish or loach are Cypriniform fishes of the family Cobitidae. They have a Eurasian distribution with greatest diversity in South-east Asia. There are two species in the genus *Misgurnus*; the European *M. fossilis* and the Asian *M. anguillicaudatus*, the latter is also known as the Japanese weatherfish or dojo. Both are sturdy, elongate fishes with very similar life histories (Berra, 1981). They are popular aquarium fish and 100,000 cobitids per year are imported into Australia, comprising about 1 per cent of all imports of aquarium fish during 1978-80 (McKay, Queensland Museum, pers. comm.). The fish have been imported from Singapore for over 20 years, they are either caught in the wild in India or cultured in Taiwan, fish 50 mm in length being about the smallest individuals imported (Fallu, Fisheries and Wildlife Division, pers. comm.).

Despite their popularity as aquarium fish and their extreme mobility and hardiness, there are no previously published records of breeding populations becoming established in the wild in Australia. In this paper, the occurrence of juvenile *M. anguillicaudatus* in the Yarra River is reported together with other evidence of possible breeding populations in Australia. The general biology of the species is briefly reviewed.

Collection of the material

Three small weatherfish were found amongst routine collections of freshwater shrimps *Paratya australiensis* taken in the Yarra River approximately 1km downstream of the Warrandyte bridge (Map. Ref. 424214 Yan Yean sheet 7922-111) between January and March 1984. The collections were made by hand-held dip nets swept amongst aquatic vegetation along the edge of the river. One of the specimens was lodged with the Museum of Victoria (MV-A3310) (Table 1).

A further collecting trip to specifically collect weatherfish was undertaken on 3 April 1984. A section of the edge of the Yarra River was fished from 20m downstream to 100m upstream of the initial collection site using a back-pack electrofishing unit and hand-held dip nets with a mesh size of 1 mm. Another five juvenile weatherfish were collected (Table 1), all from a small area (about 2 m x 5 m) of dense aquatic vegetation adjacent to the main stream. The best results were obtained by pushing the dip nets into the muddy substrate. No weatherfish were taken by electrofishing, although a carp *Cyprinus carpio* 30 mm long and goldfish *Carassius auratus* and roach *Rutilus rutilus* 100 mm long were taken by this method.

Physico-chemical parameters in the Yarra River at Warrandyte between January and April 1984 were: water temperature 15-24 °C, pH 6.47-6.88, dissolved oxygen 5.4-8.0 mg/l and conductivity 137-148 uS/cm.

Discussion

The eight juvenile weatherfish collected in the Yarra River may be the progeny of a breeding population in the river or survivors of aquarium-bred fish released into the river. The absence of adults in the collection may be due to their burrowing habits, which would make them difficult to catch by electrofishing and dip-netting. Further collecting in the area is required to determine if the weatherfish have indeed

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Table 1

Collection Date 1984	Length (mm)	Weight (g)
20 February	50	0.69
20 February	31	0.15
5 March	45	0.45
3 April	60	1.42
3 April	54	0.87
3 April	25	0.07
3 April	2 fish not measured	

established a self-sustaining population in the river. This collecting should take place during the breeding season in spring when eggs and larvae may be detected. The collecting methods may also need to be modified to be more effective in taking adult fish.

Further evidence suggesting that weatherfish may have established breeding populations in the wild is the capture in the Australian Capital Territory of a gravid female *M. anguillicaudatus* (total length 175 mm, weight 45g) taken in Lake Burley Griffin on 24 September 1980, and the collection, in January 1984 of a juvenile specimen (estimated total length 65 mm, weight 1.7g) from Ginninderra Creek downstream of Lake Ginninderra (Krucolic, Department of the Capital Territory, pers. comm.).

Weatherfish are reported to tolerate water temperatures from 4°C to 32°C (McKay, pers. comm.). They are very efficient omnivorous scavengers and have a high fecundity, laying about 150,000 eggs per season on water plants or on mud between plant roots. They grow to 220 mm long and are sexually mature at 100 mm (Sterba, 1973).

Weatherfish can move across land and are reported to utilise oxygen from the air by gulping at the water surface, absorbing it through the highly vascular hind gut and expelling carbon dioxide through the vent. Their preferred habitat is a muddy substrate in which the fish can burrow, often leaving only the head protruding above the mud; they are also reported to aestivate (Walker, 1975). The name 'weatherfish' derives from the belief, so far unsubstantiated, that the fish becomes restless during changes in air pressure (Sterba, 1973).

Due to its relatively high fecundity, hardiness and mobility there is a high risk that weatherfish may establish self-sustaining populations in the wild as has happened with several other species of exotic freshwater fish in Victoria (Cadwallader and Backhouse, 1983).

Exotic species, and even Australian native species introduced into an area where they were not the natural inhabitants, can cause severe disruption to the natural species. The introduced species may compete for food items, shelter and nesting sites, prey on native species or their eggs and, in some cases, alter the habitat thus the food chain through either eating the aquatic plants or disturbing the substrate. As a result the water quality, especially turbidity, can be quite drastically altered. Any of these disturbances may lead to the elimination or extinction of native species. It is unlikely that *M. anguillicaudatus* will cause such drastic changes, however, the effects of this species on the habitat and native species are unknown at present. Careful monitoring of the situation is required and aquarists should be made more aware of the dangers inherent in dumping unwanted fish.

Acknowledgements

Thanks go to Tim O'Brien, Justin O'Connor and Peter Christie for collection of fish, Martin Gomon for fish identification and Ric Fallu, Gary Backhouse, Kruno Krukolic and R. McKay for additional information. Darwin Evans, Peter Jackson and Phil Cadwallader deserve special thanks for their editorial advice.

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Mammals and Reptiles of Holey Plains State Park

BY B. LOBERT† AND P. GELL*

Introduction

This paper presents data collected on the occurrence of mammals and reptiles in Holey Plains State Park in South Gippsland, 200 km E of Melbourne, (38° 14′ S, 146° 55′ E; Fig. 1). The data were collected during the course of a vertebrate survey of the Park by the Monash University Ornithology Club, between May 1978 and December 1980.

Study Area

Holey Plains State Park is a 10,800 ha area of natural bushland. Parr-Smith (1978) described 29 natural vegetation alliances on the predominantly sandy soil, based on associations of dominant species. These can be divided into seven structural groups: low woodland, woodland, open woodland, open forest, regenerating scrub, closed scrub and swamp. Various understorey types occur, with mixed species heath, and bracken dominated heath being common over most of the Park.

The plains themselves are mostly less than 150 m a.s.l., but the gently sloping hills lead to a peak of 218 m at Holey Hill. The Park, surrounded by cleared agricultural land and pine plantations, is bounded by the Rosedale-Longford Rd. to the north and Merriman's Ck., to the south. Numerous marshes and lakes occur in the eastern sector of the Park. Pine plantations (approximately 450 ha) also occur within the outer Park boundary, and passing through the northern sector are two, 50 m wide easements for oil and gas pipelines. A limestone quarry and two gravel pits are also located within the Park.

The area experiences warm summers (highest monthly mean of 19°C in February) and cool winters (lowest monthly mean of 9°C in July), with rainfall (650 mm p.a.) spread evenly throughout the year (L.C.C., 1972). Further information on climate, geology and physiography of Holey Plains State Park can be found in the Report On The South Gippsland Study Area (District 2) (L.C.C., 1972).

Methods

Data were collected on ten weekends and two week-long visits. Survey techniques included small mammal trapping (aluminium folding traps 9 x 9 x 32 cm), spotlighting, bat catching (netting and trip-lines across a dam) and chance observation.

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Fig. 1.

Ground trapping for small-mammals was carried out over most of the Park and included all structural vegetation groups and most of the common floristic groups. Spotlighting was restricted to vehicular tracks and all bat catching occurred at Long Ridge Swamp in the west of the Park (Fig. 1).

A relatively small amount of time was spent surveying the reptile fauna, with most records coming from chance observations. Neither the mammal nor the reptile survey was methodically linked to vegetation type.

Results and Discussion

Mammals

Approximately 1500 trapnights, 100 spotlight hours, 30 mistnet hours and 10 hours of trip-lining resulted in the identification of 21 mammal species: one species of monotreme, eight marsupials and twelve eutherians. Ten species were regarded as widespread and fairly common, while eight species were encountered on less than 10 occasions. The distribution and abundance of the three bat species identified during the

survey is not known. Common names and taxonomy are those suggested by the Australian Mammal Society (1980).

Short-beaked Echidna (*Tachyglossus aculeatus*)

Rare, being sighted only twice, with little evidence of digging found. The inconspicuous nature of this animal probably contributed to the lack of sightings, as much of the Park appears to be suitable habitat.

Brown Antechinus (*Antechinus stuartii*)

Common and widely distributed, although not caught in large numbers in any one area. Found in woodland and forest, preferring sites with good ground cover. Often found in association with the Bush Rat (*Rattus Fuscipes*) and Swamp Rat (*R. lutreolus*).

Common Brushtail Possum (*Trichosurus vulpecula*)

Rare. Only six or seven records of this species, all from eucalypt-dominated vegetation.

Common Ringtail Possum (*Pseudocheirus peregrinus*)

Common. Recorded on all spotlighting nights in numbers ranging from five to ten per night, with one four-day period yielding 50 separate sightings. Most records come from eucalypt-dominated vegetation, but also recorded in Saw Banksia (*Banksia serrata*) and Monterey Pine (*Pinus radiata*).

Eastern Grey Kangaroo (*Macropus giganteus*)

Common throughout the Park, with groups of up to 30 animals seen in cleared areas. Smaller groups of four to six animals were often encountered in uncleared areas throughout the Park. Most macropod sightings came from cleared strips in and around pine plantations and adjacent to agricultural land.

Red-necked Wallaby (*Macropus rufogriseus*)

One animal was observed with a group of Eastern Grey Kangaroos on the S E oundary of the Park, alongside Merriman's Track. There are only a few records from the general area (Menkhorst and Mansergh, 1977a; 1977b) where it occurs in small, isolated groups (Norris, *et al.*, 1979).

Swamp Wallaby (*Wallabia bicolor*)

Common, but solitary. Not seen in cleared areas to the same extent as the Eastern Grey Kangaroo. Often disturbed adjacent to tracks during the day.

Koala (*Phascolarctos cinereus*)

Sparsely distributed, with 10 records of solitary animals. Koalas have also been recorded 15 km and 10 km west of Rosedale (Menkhorst and Mansergh, 1977a).

Common Wombat (*Vombatus ursinus*)

Three records, all from the edges of the Park, suggest this species may be rare within the Park. Although some burrows were found, none were in use. Menkhorst and Mansergh (1977a) list the nearest record at 10 km WSW of Rosedale, while Norris *et al.* (1979) consider it widespread and common in South Gippsland.

Water-rat (*Hydromys chrysogaster*)

One animal was seen crossing a track surrounded by low, swampy heath in the north-east of the Park. It may be more common in the Park than in surrounding areas, as there are many permanent and semi-permanent water bodies in the Park. Menkhorst an Mansergh (1977a; 1977b) list few records for their combined study areas and Norris *et al.* (1979) describe it as being scattered and surprisingly uncommon.

House Mouse (*Mus musculus*)

Rare, with eight widespread records. The Rosedale rubbish dump, near the western boundary of the Park, is a potential site of dispersal.

Bush Rat (*Rattus fuscipes*)

Common in most heath, forest and woodland areas. Also recorded in moist gullies. Trapping in March 1980 yielded a high proportion of juveniles, which agrees with the summer-autumn weaning described in the literature (Hyett and Shaw, 1980; Watts and Aslin, 1981).

Swamp Rat (*Rattus lutreolus*)

Locally common. Recorded from two wet gullies near Seldom Seen track and in swamp-side vegetation in southern areas of the Park. All areas had dense ground cover of heath and sedges. This species is dependant on dense cover and green vegetation (Watts and Aslin, 1981), which probably explains its restricted distribution in the Park.

Black Rat (*Rattus rattus*)

Rare, with one record from adjacent to a camping area at Long Ridge Swamp. As with the House Mouse, the Rosedale rubbish dump may be a dispersal site for this species.

Fox (*Vulpes vulpes*)

Common throughout the Park. Many diurnal as well as nocturnal sightings.

Rabbit (*Oryctolagus cuniculus*)

Common around clearings, but few sightings in bush areas. There was no evidence of myxomatosis affecting the Park population.

Hog Deer (*Axis porcinus*)

One animal was seen in the east of the Park in 1982 (R. Loyn, pers. comm.). This species is regarded as common in coastal woodland and heathland of the Gippsland Lakes catchment (Norris *et al.*, 1983), but is rare this far from the coast (about 25 km).

Bats (*Vespertilionidae*)

Mist netting and trip-lining were carried out during the spring and summer of 1979 and 1980, with both methods proving successful. At the time of the survey, specimens of the Little Brown Bat (*Eptesicus pumilis*) were identified. However, the taxonomy of this species has been revised (McKean *et al.*, 1978) and now five species are recognised within what was previously considered a single, extremely variable species. As no specimens were collected, precise identification of the *Eptesicus* spp. is not possible. Three other species were positively identified: Lesser Long-eared Bat (*Nyctophilus geoffroyii*), Goulds Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*Chalinolobus morio*). All species were common around Long Ridge Swamp, with *N. gouldii* and *Eptesicus* spp. the most numerous. Neither Menkhorst and Mansergh (1977a), nor Norris *et al.*, (1979) list *C. morio* in their study area. It has, however, been recorded 30 km north of Rosedale (Menkhorst and Mansergh, 1977b) and 45 km SSW at Gellion's Run (Lumsden and Schulz, in press). The other three species are given patchy distributions, but considered widespread and common (Norris *et al.*, 1979).

In late 1978 a small, brown macropod was seen crossing the oil pipeline easement in the north of the Park C. Silveira, pers. comm.). Its head-body length was 40 to 50 cm, and it was observed for about five seconds. It was believed to be adult, and not a juvenile Swamp Wallaby (*W. bicolor*), or Eastern Grey Kangaroo (*M. giganteus*). Three small macropods (*Potorous tridactylus, P. longipes* and *Thylogale billardierri*) may have occurred locally in historic times (Menkhorst and Mansergh, 1977a; Norris *et al.*, 1979; 1983), however, positive identification of the animal observed was not possible.

This is probably a conservative species list for Holey Plains State Park. A number of species not recorded during this survey have been recorded in similar habitat from the region in recent years (Menkhorst and Mansergh, 1977a, 1977b; Norris *et al.*, 1983): Easter Pigmy-possum (*Cercartetus nanus*), Feather-tail Glider (*Acrobates pygmaeus*), Sugar Glider (*Petaurus breviceps*), Southern Brown Bandicoot

(*Isoodon obesulus*), Long-nosed Bandicoot (*Perameles nasuta*), Dusky Antechinus (*Antechinus swainsonii*), White-footed Dunnart (*Sminthopsis leucopus*) and New Holland Mouse (*Pseudomys novaehollandiae*). A more intensive survey using a variety of techniques could well record some of these species, particularly the bandicoots, pigmy-possum, New Holland Mouse and two glider species, for which the habitat seems particularly suitable.

Reptiles

Twelve reptile species were recorded (Table 1). The Eastern Long-neck Tortoise (*Chelodina longicollis*) was seen in a number of lakes and was observed excavating and laying eggs in 5 cm deep hole on three occasions: 22 November 1979 at Clearwater Lake and Bellbird Swamp and 23 November 1980 at Holey Hill Swamp. The eggs were layed in the middle of sandy roads close to the waters edge. On subsequent visits, many empty egg chambers and egg remains were found. Fox tracks and scats around these areas suggest this species as the culprit.

Lace monitors (*Varanus varius*) were only seen on three occasions. Of the skinks, only *Lampropholis guichenoti*, *L. mustelina* and *Sphenomorphus tympanum* were regularly recorded.

The Red-bellied Black Snake (*Pseudechis porphyriacus*) appeared common in all areas.

The short reptile list for the Park is probably due to lack of organised surveying, although Norris *et al.*, (1979) report only one extra agamid and three elapids from similar habitats nearby. A more extensive use of pitfall traps in summer could reveal some of the more cryptic and nocturnal species.

Summary

Although of limited extent, this survey demonstrates the potential importance of Holey Plains State Park as a large, minimally disturbed, island refuge, in a region largely devoted to agriculture and exotic pine plantations. As there are only six public reserves catering for flora and fauna conservation in South Gippsland other than Holey Plains State Park (Norris *et al.*, 1979), preservation of this area is important for the survival of local, indigenous flora and fauna. Particularly for those species associated with coastal heathlands.

Family	Species
Chelidae	*Chelodina longicollis*, Long-neck Tortoise
Varanidae	*Varanus varius*, Lace Monitor
Scincidae	*Egernia whitei*, White's Skink
	Lampropholis delicata, Delicate Skink
	Lampropholis guichenoti, Garden Skink
	Lampropholis mustelina, Weasel Skink
	Leiolopisma trilineata, Three-lined Skink*
	Lerista bougainvillii, Bougainville's Skink
	Sphenomorphus tympanum, Southern Water Skink
	Tiliqua nigrolutea, Blotched Blue-tongue
	Tiliqua scincoides, Common Blue-tongue
Elapidae	*Pseudechis porphyriacus*, Red-bellied Black Snake

* identified by M. Schulz.

Table 1. Reptiles recorded in Holey Plains State Park. Taxonomy after Cogger (1975).

Acknowledgements

Special thanks to the National Parks Service for providing the opportunity to undertake this survey and for assistance during the survey period. The Clubs and Societies Association of Monash University provided financial assistance and the Monash Biology Society made their mammal survey equipment available to us. Animals were trapped and handled under the provisions of a Fisheries and Wildlife Division permit.

Many thanks also to the nameless hordes who helped during the survey, particularly: Ian Christensen, Nick Dudley, Peter Heazlewood, Mathew Lloyd, John McGuckin, Steve Mueck, Manfred Ruff, Martin Schulz, Charles Silveira, Anthony Sokol, Simon Stirrat, Malcolm Turner, Simon Veitch and Lance Williams.

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Naturalist Review

A Biology of Acacias

BY T. R. NEW, Oxford University Press

This book is billed as a "new source book and bibliography for biologists and naturalists", and even if no pun was intended, this certainly fulfills that object. It is a concentrated encyclopaedic account into which students of acacia can delve. His treatment of the arthopod and other organism interactions clearly reflects his interests. The whole concept of the work reveals the complexity of the subject and shows much of the courage of the author. In particular, it leaves one wondering to what extent the various taxonomic groups of acacias reflect differences in fungal, insect and mammal reactions — in much the same way as do the various subgenera of the eucalypts. Perhaps a little more could have been said of ecological distributions in Australia, the *Acacia melanoxylon — Atherosperma* rainforests and the surge of nitrogen fixation following mass regeneration initiated by infrequent fires. The bibliography and indices of scientific names are valuable. An index to the full record of other terminology would have been an added advantage.

— D. H. Ashton

Community Organization of Ants in the Victorian Mallee

By Alan N. Andersen*

Introduction

Ants in the semi-arid mallee region of northwestern Victoria are extremely abundant and diverse (Andersen, 1983; Andersen and Yen, in press). Since different species of ants often require similar food, nesting and foraging conditions, they often interact strongly with each other, and as a result diverse assemblages of ants tend to form well-integrated communities. The question of species coexistence has long interested ecologists — how is it that different species with similar ecological requirements are able to coexist? This question is particularly relevant to the diverse ant communities of the Victorian mallee, where more than 150 species can be found in an area less than 1 ha. The answer to species co-existence in communities such as these lies in the ability of different species to avoid competition with each other. They are able to do this because of differences in diet (ants may avoid competition with each other by specializing on different types of food, such as seeds or particular insect prey; and for species which eat similar food types, differences in body size often result in differences in the size of food items taken), habitat preferences (different species may occupy different parts of the habitat), and time of foraging (different species often forage at different times of the day and at different times of the year).

P. J. M. Greenslade has recently developed a scheme for analysing the structure of the diverse ant communities characteristic of semi-arid southern Australia, and this scheme focusses on the way different species avoid competition with each other (Greenslade, 1979; Greenslade and Halliday, 1983). In the following analysis, Greenslade's scheme is used to investigate organization in the ant communities of semi-arid northwestern Victoria; the analysis is based upon studies of ants associated with heath and mallee vegetation on sandy soils in Wyperfeld National Park, which have been described in detail by Andersen (1982, 1983) and Andersen and Yen (in press). A summary is presented in Table 1.

Wyperfeld Ants

As at most sites in southern Australia, the vast majority of Wyperfeld species nest within the soil and are active on the soil surface, and sometimes vegetation. This contrasts with the situation in warm, wet forests, where two other elements are often well-developed: arboreal species that nest and forage in vegetation, and cryptic species that nest and forage within soil and litter layers. Such stratification of ant communities reaches its peak in tropical rainforests.

The Wyperfeld communities are dominated (in the sense of being both abundant and influential) by species of *Iridomyrmex* (category 1, Table 1), particularly members of the *agilis*, *dromus* and *itinerans* groups.*[1] In slighlty more mesic sites at Wyperfeld, other groups (particularly *rufoniger* and *nitidus*) are dominant. These are all medium-sized species (2.5-3.5 mm); the large (8 mm), well-known meat ant (*I. purpureus*) is also locally abundant, but only on heavily textured soils. Due to their abundance,

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[1]* The taxonomy of Australian ants is poorly known, and so most species can only be assigned to general groups.

high rates of activity, aggressiveness, and ability to monopolize resources, dominant *Iridomyrmex* have a profound influence on other ants, and provide the framework around which the remainder of the community is based. When two or more *Iridomyrmex* co-exist at a site, competition between them is very strong and often produces a spatial and temporal mosaic of dominant species. At Wyperfeld, for example, *agilis* species are dominant during summer, but are relatively inactive during winter when species of *itinerans* predominate. *Dromus* species are abundant throughout the year, but are exclusively nocturnal and therefore have little contact with diurnal *agilis* and *itinerans*. Although several species of each group are abundant at Wyperfeld, usually only one is common at any one place.

Sub-dominant species of *Camponotus* (category 2) may also be abundant and highly active, but are usually inferior competitors to *Iridomyrmex*, and often co-exist with them through differences in body size, or time of foraging. Very many species of *Camponotus* occur at Wyperfeld, with the most abundant belonging to the *claripes* (5-8 mm) and *nigriceps* (7-12 mm)

Table 1. Summary of the structure at the ant communities associated with heath and mallee vegetation on sandy soils in Wyperfeld National Park. See text for details.

STATUS	TAXA	No. Species	*Rel.(%) Abun'ce
1. Dominant *Iridomyrmex*	many species, particularly belonging to the *agilis, dromus* and *itinerans* groups.	16	44
2. Sub-dominant *Camponotus*	many species, with the most abundant belonging to the *claripes* and *nigriceps* groups.	29	3
3. Frequency related to	*Melophorus*	13	5
a. climate	*Meranoplus*	3	1
b. soils	*Aphaenogaster barbigula*	1	<1
4. Cryptic and arboreal species			
a. cryptic	species of *Acropyga, Brachyponera, Solenopsis* and *Strumigenys*	4	<1
b. arboreal	species of *Podomyrma, Froggattella* and *Dolichoderus.*	10	<1
5. Opportunists	absent	–	
6. Generalist Myrmicinae	*Crematogaster*	6	7
	Monomorium	8	36
	Pheidole	6	5
	other	2	<1
7. Large, solitary foragers	*Myrmecia pyriformis* and *urens* groups.	4	<1
8. Dietary specialists			
a. seeds	(?) *Chelaner insolescens* group	2	<1
b. arthorpods	*Cerapachys* spp.; tribe Dacetinae	7	<1

*From pitfall trap data.

groups (fast-moving *ephippium* species are common on heavier soils), both of which are mostly nocturnal.

Category 3 comprises species whose frequencies are related to certain physical factors such as soils and climate. *Melophorus* and *Meranoplus* (category 3a) are best developed in arid regions, and at Wyperfeld are both abundant and rich in species (particularly *Melophorus*). *Melophorus* species owe their succes to an ability to forage during extremely high temperatures, when most other ants are inactive (they are inactive themselves during the cooler times of summer days, and throughout the cooler months). Species of *Meranoplus* appear to be able to survive because of their submissive behaviour, heavily-armoured integuments, and retractable appendages. Species of *Aphaenogaster* (category 3b) build complex tunnelling systems for nests, and are therefore mostly confined to sandy soils (*A. longiceps* is a common and conspicuous ant on sandy soil throughout coastal eastern Australia). Their foraging tends to be nocturnal, which separates them from most *Iridomyrmex* activity; however they are rarely abundant in extremely diverse ant communities.

Category 4a (cryptic species) comprises species that forage almost exclusively within soil and litter (they are mostly < 2 mm in length) where they are often predaceous on micro-arthropods. As previously mentioned, cryptic ants are best developed in warm, wet forests where dense litter supports large populations of micro-arthropods, and are poorly represented at Wyperfeld. Here, other tiny species (e.g. *Paratrechina minutula* group, *Plagiolepis nynganensis* group, *Iridomyrmex darwinianus* group, and some *Stigmacros*) are abundant, but their large eyes suggest they spend much of their time foraging on the surface, and therefore cannot be considered as being truly cryptic. *Froggattella kirbyi* and species of *Podomyrma* and *Dolichoderus* may be considered arboreal (category 4b, an addition to Greenslade's scheme) since they forage predominantly on vegetation, and (at least on some occasions) nest within the trunks of mallee trees. Many other ants are abundant on vegetation (particularly species of *Camponotus, Iridomyrmex, Crematogaster* and *Myrmecia*) but probably most of these nest in the soil.

Category 5 (opportunists) comprise species whose wide dietary preferences (often including seeds), flexible foraging times, and broad physical tolerances enable them to successfully colonize disturbed habitats, and thus act as 'weed' species. However, because they are also unspecialized they are generally poor competitors, and are therefore often excluded from the diverse ant communities of Wyperfeld. The greenhead ant, *Rhytidoponera metallica*, is a common opportunist throughout south-eastern Australia, and is abundant at some Wyperfeld sites.

The generalist myrmicines of category 6 comprise a large group of species that appear to be poorly integrated into ant communities, probably because of their late arrival (in geological time) in the Australian fauna. Because of their unspecialized behaviour they are often extremely successful opportunists, but are somewhat of an enigma in that they are able to persist (and are often extremely successful) in diverse ant communities. In fact species of *Monomorium, Pheidole* and *Crematogaster* are among the most abundant ants at Wyperfeld. It appears that their flexibility enables them to successfully occupy any 'ecological gaps' within the *Iridomyrmex* framework.

Large, solitary foragers (category 7) are represented here by the well-known bulldog ant genus *Myrmecia*. Two major taxa may be recognized at Wyperfeld: very large (up to 20 mm) members of the related *pyriformis* and *desertorum* groups, whose nest entrances are conspicuously surrounded by large, decorated mounds; and smaller (ca. 7 mm) members of the

urens group, which are commonly found on vegetation. Most species are brightly coloured, which may warn potential predators of their powerful sting. Because of their large size and low density they have little interaction with other ants, and possibly compete instead with other predaceous arthropods such as spiders. Other ants belonging to this category and found at other Wyperfeld sites include large species of *Rhytidoponera*.

The final category (8) represents an addition to Greenslade's scheme, and comprises species which may avoid competition with other ants because of their specialist dietary preferences. These include the so-called harvester ants (8a; many of these could also be placed in category 3a), in which seeds form a major part of the diet. This possibly applies to species of the *Chelaner insolescens* group, which appear to specialize on eucalypt seeds (they have an extremely modified clypeus, which may assist seed transport). In other parts of the Australian arid zone (and probably also Wyperfeld) the *whitei* and *rothsteini* groups of *Chelaner* are seed specialists, as are some species of *Melophorus* and *Meranoplus*. Finally, specialist predators of certain arthropods (8b) include species of *Cerapachys* (which prey on other ants) and members of the bizarre myrmicine tribe Dacetinae (represented here by species of *Colobostruma*, *Epopostruma* and *Mesostruma*).

Although this analysis provides a useful basis for an understanding of how the diverse ant communities of Wyperfeld function, this understanding is still in its infancy. Due to the poor state of knowledge of most Australian ants, many of the above observations are very tentative. Moreover, just about all the propositions regarding species relationships are hypotheses based entirely upon inferential evidence, and the manipulative experiments required to test them are generally lacking. Furthermore the ecological roles of major genera (such as *Stigmacros*, *Notoncus* and *Prolasius*) are almost totally unknown. It is to be hoped that articles such as this will succeed in stimulating the much-neglected interest of field naturalists, so that hopefully our ants start to get the attention they deserve!

Acknowledgements

I wish to thank Dr. P. J. M. Greenslade for his most stimulating ideas on the ecology of Australian ant communities.

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Banksia Atlas

Following the success of the Bird Atlas, a Banksia Atlas is proposed. To launch the project an information session will be held in the hall of the National Herbarium, Birdwood Avenue, South Yarra on Wednesday, 19th December, 1984 at 8.00 p.m. Anne Taylor from Western Australia, the Director of the project, will be present. Site record sheets, an instruction book and supplementary field guide will be available. If you require further information, contact Alf Salkin (ph. 232 6213).

Interesting Uses of Clay

By A. W. Beasley*

This article is concerned with two interesting uses of clay, one in foreign lands and the other in Australia. The first deals with clay used for making tablets upon which was inscribed cuneiform writing in Middle East Countries (Fig. 1). The second concerns the burnt clay pellets used by the Australian aboriginals as heat retainers in their cooking (Fig. 2).

Cuneiform lettering is the earliest known form of writing and was used by the Mesopotamians in the 4th millennium B.C. Mesopotamia comprises the larger part of modern Iraq, between the rivers Tigris and Euphrates. The cuneiform script was invented by the ancient Sumerians who inhabited an area lying near the mouths of the Tigris and the Euphrates. The writing was done in moist clay which had been moulded into the shape of tablets. Most of the lettering is composed of wedge-shaped marks. When all of these marks were incised or impressed into the soft clay, the moulded slabs were baked to form durable tablets. Hundreds of thousands of cuneiform tablets have been unearthed in lands extending from the Mediterranean Sea to the Persian Gulf, and in Iran.

As the result of archaeological excavations and studies carried out during the last 125 years it seems that the use of cuneiform script spread from the ancient Sumerians to the Babylonians, Assyrians, Hittites and members of other ancient people who, in spite of many ethnic differences, were in sufficient contact with one another to develop similar civilizations.

It is understood that the writing was done by impressing the edge of a reed (later a metal stylus) of triangular cross section into the wet clay. In this way straight lines were made in the clay without the blurred edges that drawing produced; this technique gave the characteristic wedge-shape lettering.

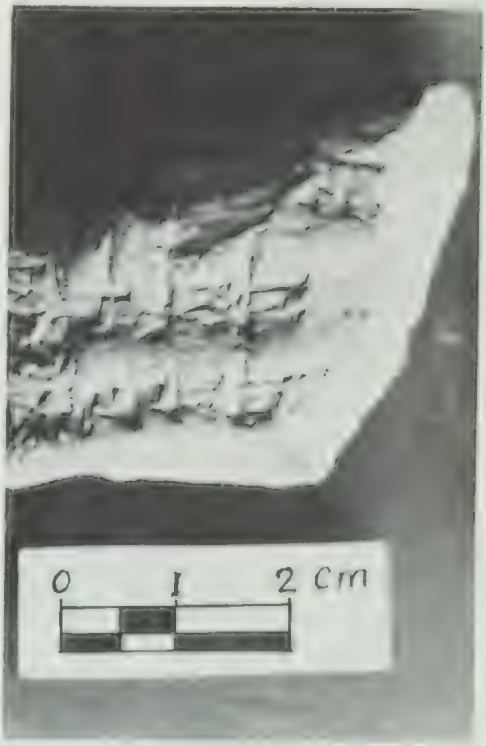

Fig. 1 Ancient cuneiform writing on portion of baked clay tablet from Iraq

Clay has been used by man since very early times. The inhabitants of early urban communities in the Middle East used it to make bricks, pottery, tiles and tablets to write on several thousand years ago.

In these early civilizations it was observed that clay became plastic when mixed with a small amount of water, and that such a paste could be moulded into various desired shapes. At first the

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Fig. 2. Burnt clay pellets used by aboriginals in N.W. Victoria as heat retainers in their cooking

moulded objects were merely dried and baked by placing them in the hot sun, which converted the clay into a brittle but firm "stone". However, with the passage of time it was learnt that a fire was better for the purpose, at first wood and later coal being used as fuel. It was found that after a clay object was brought to a glowing red heat the material hardened permanently, retained its shape, became remarkably strong and was no longer affected by moisture.

There are several distinct groups of clay minerals, the most important ones being kaolinite, montmorillonite and illite. They are all essentially hydrous aluminium silicates, but other chemical elements such as magnesium potassium, calcium, sodium and iron are present in the composition of certain species.

A large number of the cuneiform inscriptions have been deciphered, and it has been revealed that the ancient writings deal mainly with legal matters such as contracts, acknowledgements of debts, judgments rendered in courts, as well as administrative and diplomatic correspondence, etc. Because of the inconvenience of writing on slabs of damp clay and the complexity of the writing system, members of these ancient people seem to have written only when economic or political necessity demanded it. Cuneiform tablets do not contain historical and literary material of a nature comparable to the written material of the ancient Greeks and Romans. Nevertheless, cuneiform writing on slabs of damp clay, which then had be dried and baked, extended over a very long period of time. One of the cuneiform clay tablets that has been discovered was written as

late as about 75 A.D.

An entirely different, but very practical, use of clay was made by our Australian aboriginals. Clay was moulded by the aboriginals into pellets or balls for use as heat retainers in the cooking of their food, particularly in regions where there was an absence of rock on the surface. This was the case in large areas of south-eastern Australia, especially on the floodplain of the Murray River.

Australian aboriginals made ovens for cooking their food by digging pits into the ground. These pits were commonly lined with damp grass before the food was put in, and the food was covered with more damp grass. Where there were no stones in the vicinity, pellets of clay that had been fired separately were often then placed in the pit before it was sealed with silt and clay. When the food was cooked the aboriginals cleaned out the pit. The same pit was often used time after time for cooking operations, and refuse heaps accumulated alongside it, gradually forming mounds on the surface.

In recent years detailed investigations of mounds occurring in parts of north-western Victoria have been carried out by the Victorian Archaeological Survey. Some 122 of these refuse heaps from aboriginal cooking operations have been found in the Nyah Forest on the floodplain of the Murray River to the north-west of Swan Hill, and several of the mounds were systematically excavated by Survey workers. They were found to be composed of burnt clay pellets, charcoal, ash, silty clay and food refuse such as bones. The clay pellets have been studied by scientists of the C.S.I.R.O. and Victorian Department of Minerals and Energy. Most of the pellets are about 3 centimetres or somewhat less in diameter, but they range up to 14 centimetres. Small capillary-like cavities run through some of the pellets; this suggests that the clay contained plant matter such as reed stems that were burnt out during firing. Groove marks, seemingly made by sticks, and finger-print marks were observed on the burnt clay pellets.

In making the heat retainers to be used in their cooking ovens, it is presumed that small lumps of clay and hand-moulded pellets were heated by the aboriginals in the ashes of a fire to a relatively high temperature, and wooden sticks which acted as tongs were used to move them after the firing. It is believed that the clay generally was obtained from local sources. On the floodplain of rivers such as the Murray, the clay used by the aboriginals was of fluviatile origin. It contained impurities and did not consist of a single clay mineral.

Radiocarbon dating indicates that the use of clay pellets for heat retainers in cooking by the aboriginals of north-western Victoria extends back in time at least 2,000 years; most probably its use in their cooking ovens extends back many more thousands of years, but this is as yet unproven.

The use of clay pellets by the Australian aboriginals appears to be a little known but very interesting use of "heat beads" in cooking.

Acknowledgements

I am indebted to Mr. H. A. Keys of Tullamarine for the photograph of burnt clay pellets excavated from an aboriginal mound in north-western Victoria.

DEATHS

We regret to announce the recent deaths of Mr. Alan Morrison and Mrs Eulalie Bennet. Mrs Bennet was the Club's oldest member, having joined in about 1918. Mr Morrison had been an active member of the Club since 1960 until his illness.

Obituaries will appear in later issues.

A Branch Loop from a Natural Graft in a Red Gum Tree, Bundoora Park, Melbourne

BY N. W. SCHLEIGER[1] AND T. E. GEORGE[2]

A closed loop branching system has been discovered in a mature red gum tree (*Eucalpytus camaldulensis*) just east of the car park and toilet area east of the new museum area at Bundoora Park. The site of the tree is within sight of Plenty Road and opposite Mont Park's southern boundary.

The height of the engrafted branch forming the loop between the two separate branch systems is approximately 11m above ground level. The height of the tree is estimated at 23m and the girth at breast height is 3.2m.

Setting

Apart from the closed loop branch system this red gum is typical of most indigenous red gums left growing in the Park. The trunk has an initial lean away from the 320° direction at 60°, but becomes vertical soon after 2.5m then if anything is directed to the North at about 80° to the ground surface. The lower branches have long gone, the scarred wood tissue and protuberances left as evidence.

Tree Bole

The bole is elongated in the 320° direction with corresponding transverse and longitudinal tap roots to support the trunk system and canopy. The main roots on the SW side of the bole are much deeper in the soil as no surface roots are visible. The trunk lean and the elongation of the bole in the 320°-140° direction is consistent with a persistent north-westerly wind throughout the growth history of the tree (Schleiger, 1982; 1983a, 1983b). The parent rock is brown Tertiary quartzitic sandstone, probably of Miocene age or earlier. Most of the present big old red gums of the Park thrive on the Tertiary sandstone, as they probably have done for thousands of years previously.

Canopy

The asymmetry of the canopy suggests cropping of the canopy on the NE, SSE and NW directions successively (Fig. 1). This is interpreted as a summary of the seasonal northern suburban wind history over the years. Northerlies and easterlies blow strongly before a cool change, whilst southerlies and south-westerlies blow after the change. The northerlies and easterlies are devastating in summer and autumn, whilst the southerlies and south-westerlies dominate in winter. As this locality is on the lee side of Bundoora Hill, the effect of

Fig. 1. Asymmetrical profile of the canopy of the natural loop branched Red Gum, Bundoora Park viewed from the east. The trunk leans away from the NW. The canopy has a northerly wind ramp cut into the upper foliage rising to maintain an even height on the southern side.

[1] Phillip Institute of Technology, Coburg Campus, P.O. Box 179, Coburg, Vic., 3058.
[2] 17 Ashley Street, Reservoir, Vic., 3073.

south-westerlies is minimised here, Schleiger (1982, 1983a, 1983b), Jamieson (1983), O'Shea (1984).

The natural graft

As shown in Fig. 2, the engrafted branch links a NW directed lateral at its upper junction with a vertical-directed unit from a north directed lateral at its lower junction. The effect of the graft is to strengthen the middle upper branch system to the strongest N prevailing and most destructive winds in this area. If the engrafted branch is regarded as a strut then this strut is parallel with the direction and axis of elongation of the canopy profile in the prevailing northerly wind direction.

The two opposing limbs would

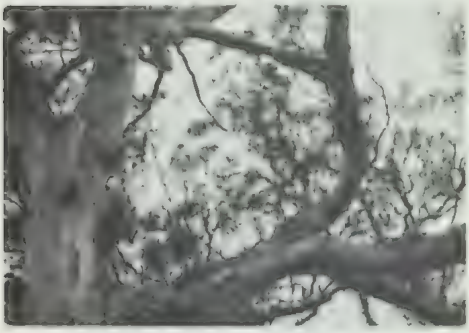

Fig. 2. The branch loop system as seen from a "cherry" picker" from the east. The discontinuity in the two engrafting branches 65cm from the right with characteristic kink is shown in Fig. 3

necessarily first have to expose sap wood by rubbing and then butt hard so that no movement could take place so that the graft would be effected. A peculiarity of *E. camaldulensis* branching is that there are numerous 3rd order and higher downward growing branches as well as upwardly directed branches from the one main lateral branch. Many of the downwardly directed braches eventually die back from their distal extremities. Others grow downward initially and then deviate upward and do not die back as frequently. The authors therefore hypothesize that such an angular branch grew down from the upper junction and was abutted by a thicker upwardly directed limb from the lower junction. After initial rubbing to partially expose sap wood, the ensuing growth of both abutted limbs results in a gradual clamping of the two at the bend of the upper limit.

Once the graft was effected, the distal end of the upper limb would die and break off and the break was healed to produce the "kink" (Fig. 3).

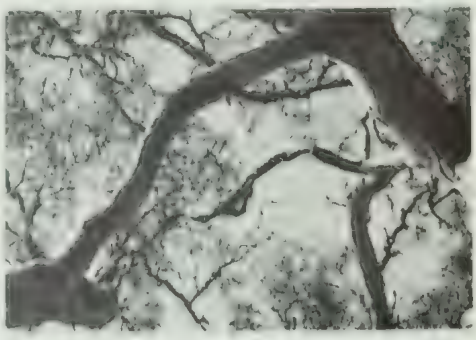

Fig. 3. Close up of the strut at 11m above the ground to show an abundance of scars (former shoots) from the upper surface and very few from the underside. No shoots grow from the link branch at present.

Obviously the sequence of events was unique and not likely to be repeated often. It is because the two branches were growing in opposing directions head on, that the graft was ultimately successful.

Fig. 4 shows a similar situation in a lower part of the canopy which will not produce a graft because the upper limb and its lower contact function in dead wood.

The physiological question of sap flow in such a graft is an interesting issue. With a normal graft of scion to stock, there is normal flow of sap from root to leaf and back. The graft is just a logical extension of the stock upwards or outwards. However in this graft, root stock grafted to root stock, the sap flow would have to accommodate the loop. It is interesting that there are no existing shoots or branches from the loop branch.

Fig. 4. Characteristic downward growing branch on the same tree is supported by another lower lateral branch. The distal end of the supported branch is dead beyond the contact point. A graft would be likely if both branches were opposed and growing head on or wedged hard against the lower lateral.

Distribution of scars on the upper surface are uniformly distributed on either side of the graft. Growth then was most active on the upper surface of the loop.

The important physical contribution of the grafted loop was to strengthen the tree in the strongest upwind direction. The question of sap flow remains unresolved except that branches and shoots above both sides of the graft show vigour.

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Field Naturalists Club of Victoria

Reports of recent activities

General Meeting
Monday, 8th October

The meeting stood and observed silence on the recent passing of two members, namely Jack Wheeler, who died on 4th October, aged 75 years, and Dr. W. J. Long of Bendigo. Jack Wheeler was a well-known naturalist having, amongst other things, been founding Secretary of the Ballarat Field Naturalists Club and writer of the nature notes column for the Ballarat Courier. Dr. Long was a great lover of the outdoors right up to his death.

Honorary membership was awarded to Catherine Palmer on completion of 40 years membership.

Speaker for the evening was Geoff Wescott, lecturer in environmental management at Rusden College. A past Director and current Vice-President of the C.C.V., Geoff completed a Masters degree at Melbourne University on Victorian intertidal crabs.

Geoff's talk focussed on true crabs (Brachyurans "short tail") — which have ten legs, a fused head and thorax, and a reduced abdomen — as opposed to Anomurans, e.g., hermit crabs. Sexes can be distinguished by the shape of the underside of the abdomen, V-shaped in the male, and broadly semi-circular in the female. In the female this flap assists in carrying the eggs. The eggs hatch into zoae (micro-larvae) which float in the water for 30-35 days (depending on the water temperature), during which time they may travel great distances. They also may moult several times, going through a number of different stages before they are deposited on the shore as juvenile crabs.

In order to grow they must continue to moult through to adulthood — their dried-out shells are often seen on the beach. Some crabs that camouflage themselves with seaweed, etc. have to do so after each moult.

Geoff presented (with slides) brief descriptions of some of the more common of the 53 species of crab to be found on the Victorian coast, including:

Portunid family (swimming crabs) — last section of rear leg flattened to facilitate rapid swimming, eg., *Carcinus maenas*, the European Common Shore crab, a fairly aggressive predator which eats small molluscs, and *Nectocarcinus tuberculosus*, the Rough Rock-crab.

Leptograpsus variegatus, Common Shore crab — this quite large crab (carapace up to 10 cm across) may be seen on open rock platforms hiding in crevices and scurrying over the open spaces. It feeds on algae growing on rock surfaces.

Family Grapsidae (all have a more or less square carapace); *Helograpsus haswellianus*, Mud crab — burrows in estuarine bank at high tide level; *Brachynotus spinosus*, Little Shore crab, a small crab (carapace up to 1-5 cm across) that scavenges on a wide range of foods.

Also from the family Grapsidae are two species which Geoff studied as part of his thesis, the Purple Shore crab, *Cyclograpsus granulosus*, and the Smooth Shore crab, *Cyclograpsus audouini*. These two similar species have an overlap in distribution near the Victorian/South Australian border, but they avoid direct competition with each other due to their occurrence at different levels on the shore (*audouini* occurs higher up the shore than *granulosus*). They also have displaced breeding seasons.

Exhibits: Under the high-powered microscope were nine stained sections of different plant parts revealing intricate patterns of arrangement of the internal structure.

A juvenile Eastern Snake-necked turtle, *Chelodina longicollis*, showed the striking ventral orange markings that occur only in hatchlings. This specimen was found in a small lake in western Victoria.

From a recent Mammal Survey Group camp to the Strathbogies came the fungus Earth Tongues growing on a log.

Finally, there was an unidentified bird's nest that had been found hanging from grass stems.

Nature Notes: From the same Mammal Survey Group camp mentioned above Swamp Wallaby, Koala and Boobook Owl had been recorded.

It was reported that a large Marbled Gecko had returned to the outside of a bathroom window at least 12 months after it had first been observed.

At the north end of the Grampians an albino Brushtailed Possum was observed following a normal-coloured one up a tree trunk.

Ringtails seen nesting in a lime tree were enjoying a diet of the rind of that fruit while snails were similarly attacking ferns growing in a backyard.

In the Mount Clay area hairy caterpillars (identity unknown) have been feeding on bracken and have stripped approximately 10% of that species growing in this area.

General Meeting
Monday, 12th November

The meeting stood and observed silence on the passing of Alan Morrison, on the 23rd October. Jim Willis then spoke of Alan who, as a member of the FNCV since 1960, was perpetually cheerful, a great inspiration, and perhaps the best natural history photographer the FNCV has seen for many years. Once on a field trip to Western Australia he worked all night making flashlight photographs. A lover of field exploration there were few parts of Australia he and his wife, Win, hadn't seen in their 'Kombi' van. In fact it was on a field trip

to Gippsland in 1982 that he suffered a stroke from which he never recovered.

The Australian Natural History Medallion was awarded to Kevin Kenneally of Western Australia. Making the presentation Dr. David Churchill outlined Kevin's long list of achievements in the field of natural history particularly his long and close involvement with the W.A. Naturalists (a past President and current Editor of their journal). This is apart from his work as a professional botanist with the W.A. Department of Agriculture, and an envious publishing record. Dr. Churchill pointed out that within 48 hours of the announcement of the award the Premier of W.A. had sent Kevin a letter of congratulations and he said it was gratifying that the merits of science are recognised.

Upon giving thanks Kevin presented his talk for the evening on "The Wongan Hills Biological Survey". The Wongan Hills is a relatively small island of natural bushland in an otherwise largely cleared area within the W.A. wheatbelt. A laterite capping means the Hills are unsuitable for agriculture.

In 1973 the W.A. Naturalists Club, after being approached by the local Shire, undertook a systematic survey of the plants and animals (including invertebrates) of the Hills in monthly visits for three years. A two and a half hour drive from Perth intending surveyors would arrive at the Hills Friday night and stay until Sunday night. Different teams recorded different aspects (bird censusing, vegetation transects, etc.) and at intervals people could move from one team to another if they wished. Kevin stressed the importance of involving local people, with their good knowledge of the area, and highlighted this with the situation where students from a local high school drew the attention of the Naturalists to the edible yam *Platysace cirrosa*, which had hitherto gone unnoticed.

Kevin showed many slides of plant species to be found in the Hills including a large number which are endemic to the area, eg., *Calothamnus asper* and *Melaleuca websteri*. Several plants new to science also 'turned up' in the survey, viz. *Acacia botrydion*, *Acacia pharangites*, *Eriostemon wonganensis*, and *Rhagodia asicularis*. Kevin estimates that 90-95% of all the plant species of the Wongan Hills have now been recognized, and he felt that surveys of this kind required a minimum of 4-5 years duration. This survey formally finished in 1977, and the data was brought together in a handbook, but monitoring groups still continue the work.

Exhibits: There were a large number of exhibits, as follows:

Lucernaria (like a sea anemone on a stalk"), and the polychaete *Terebella*, from Black Rock.

a large collection of Scarab beetles

a tiger snake skin from Cherry Lake, Altona

– a number of spiders, beetles and bugs from the Mammal Survey Group camp at Red Bluff, as well as a spider from the Acheron River

half of the mandible of an Eastern Grey Kangaroo from Kimbolton State Forest

several plant specimens, viz. Rape, *Brassica napus*, Silver Gum, *Eucalyptus crenulata*, Scottish Broome from Macedon, and Topped Lavender, *Lavendula stoechas* from Castlemaine

– a Quokka skull from Rottnest.

Nature Notes: There was an interesting story of a Magpie taking a snake at Yanac. The Magpie took about three minutes to kill the one and a half foot long snake, never holding it for more than about one second.

There were also observations of a Koala, and an Emu with chicks in the Grampians, and a report of snails (*Helix aspersa*) tunnelling through polystyrene fruit cases. This is further to an earlier report of birds 'attacking' such fruit cases.

Victorian Field Naturalists Clubs Association Excursion — 6-7 October, 1984

The Springtime Get Together of the Victorian Field Naturalists Clubs Association was held on 6 and 7 October 1984, in the Ringwood District, the Host Club being the Ringwood Field Naturalists Club. Saturday 6, October was one of the first beautiful spring days after the wettest September since 1920, thus the flowers in the Hundred Acres Reserve at Park Orchards were fine and abundant. Sixty three persons from 11 different Clubs attended from as far as Bairnsdale, Latrobe Valley, Upper Goulburn and Creswick. The President, Mr. Alan Monger, brought his family from Benalla and camped at Warrandyte. After lunch Mr. Ron Norris, the President of Ringwood Field Naturalists Club welcomed the visitors, and an illustrated briefing was given by Murray Bouchier, Frank Gibbons and later by Mark Gottsch, thus we learned how the Hundred Acres had reverted from an orchard back to its natural bush by careful husbandry over ten years. Pines and other introduced vegetation have been removed, walking tracks and horse trails formed and regeneration of the original bushland has been very gratifying. Frank showed us in a small quarry how the Melburnian Silurian sandstone had a layer of yellowish friable clay on top and above this a shallow top soil where seedlings could grow

The party was led by Murray Bouchier who lives near the perimeter of the park.

The pattern of the upper storey of forest vegetation is typical of eastern Melbourne bushland. Red Stringy Bark (*Eucalypt macrorrhyncha*) with some Messmate (*E. obliqua*) was common on the ridges, peppermints (*E. radiata* and *dives*), Candlebark (*E. rubida*), Yellow Gum (*E. leucoxylon*) and Manna Gum (*E. viminalis*) appeared lower down the slopes and red box (*E. polyanthemos*) grew on the drier clay slopes with Swamp gum (*E. ovata*) and Burgan ti-tree (*Leptospermum phylicoides*) near the water holes.

The middle storey in the forest was composed chiefly of acacias, sweet Bursaria (*B. spinosa*) and some cherry ballart (*Exocarpus cupressiformis*), and *Clematis mircorphylla* festooned some of the bush

The showiest ground cover in the forest was provided by the gold and red of *Bossiaea prostrata* and clumps of *Acacia aculeatissima* (the thin leaved wattle) and the bright pink bells of *Tetratheca ciliata*.

Nine different species of orchids were recorded, the most common being *Glossodia major* and *Pterostyles longifolia*, there were numerous sun orchids (*Thelymitra* sp.), but none were in flower, the chocolate lilies (*Dichopogon* sp.) were also in bud.

Approximately 37 species of native birds were both heard and seen, the olive backed oriole being most conspicuous in the Hundred Acres and we heard the courtship call of the white throated tree creeper and recorded four Australian cuckoos, the pallid, fantail, Horsefield's bronze and Golden bronze, as well as Eastern and Crimson rosellas, galah and sulphur-crested cockatoo.

After a meal in the Domeney Reserve hall, a brief general meeting was held and roll call; then came a fascinating illustrated talk by Jack Hyett on Naturalists of the Ringwood district over many years. He began his lecture with a photograph of A. J. Campbell who was the first to discover the eggs of the Helmeted Honeyeater in a rotten tree overhanging Olinda Creek and in trying to obtain them, the tree and A. J. Campbell and the hen who remained on her nest of eggs all went into the creek. Next he spoke of A. J. Campbell, Audas, Leach, Robert Hall, T. S. Hart, Edith Coleman, Fred Rogers, Maurice Streeter, Cecily Falkingham and Christine Gray who all lived and wrote in the district Jack Hyett then showed photos of more recent naturalists living in the district, Bill and Marion King, Dick Morrison, Keith and Beryle Richards, Bruce Fuhrer, Doug Thomas, Garry Cheer, Mark Gottsch, Tess Clute, Ellen McCulloch and Murray Bouchier to a name a few

Jack gave a small resume of the particular feature of Natural History in which each of these folk excelled and the audience was delighted. After the meeting such a lavish supper was provided by the Ringwood Club that it was suggested that no-one need bring lunch on the following day

Sunday, October 7th was another fine day with a temperature of 23°C and there was an excursion to Jumping Creek Reserve, Warrandyte; about 58 persons attended and walked in single file along the Yarra River banks which were covered with various mosses, lichens and ferns, some spectacular bracket fungi were seen on fallen logs and patches of Morels. Fresh wombat burrows were common and several patterned skinks about 9 inches

long crossed the track. A small leaved Pomaderris made an impenetrable broom-like thicket in places, apparently this had occurred following the 1939 bushfires. Numerous fungal fruiting bodies of the vegetable caterpillar *Cordyceps* were found and some were branched and most were 4-6 inches high.

The Bird Orchid (*Chiloglottis gunnii*) was in flower and there were numerous patches of the leafy basal rosettes of the Helmet orchid (*corybas*), but no flowers. Eleven species of orchids were found in flower.

There was evidence of recent river flooding and some of the tracks were obliterated, but we viewed the remains of the old water wheel on the opposite bank, a relic of the gold mining era, Warrandyte being the first location in Victoria for the discovery of gold in 1851. We also visited the overgrown chapel which was formerly used by a Scout camp.

At the Sandy Bay picnic area the Ringwood Field Naturalists had arranged lunch and provided tea and coffee.

As this was the first occasion on which the Ringwood Field Naturalists Club had hosted a week-end meeting of the Victorian Field Naturalists Clubs Association, special thanks were recorded for such a successful meeting.

Elizabeth K. Turner

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The editorial committee would be pleased to hear from any member who may work for or patronise any firms who could be interested in placing advertisements in the magazine. Please contact the committee via the National Museum, Russell Street, Melbourne with any suggestions on potential advertisers.

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which is Peace
the Gladness of Christmas
which is Hope
the Heart of Christmas
which is Love

from
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of Victoria

WANTED

Council is looking for someone to fill the position of **Subscription Secretary,** which will fall vacant this month. Duties include the maintenance of membership records (produced by computer) and the collection and backing of subscriptions. Attendance at General meetings, on the second Monday of each month, for this purpose is required. The salary is $1000 per annum, payable in monthly instalments. While this job does not require a great deal of time, it is an ongoing task to keep all matters up to date. If you are interested in this position please contact the Secretary, F.N.C.V. c/- National Herbarium, Birdwood Avenue, South Yarra 3141, or by phone (551 2708 A.H.).

We are also looking for someone to be **joint convenor of the 1985 Nature show,** with Noel Disken, who organised our successful Show this year. We have plans for a bigger Show next year, in Victoria's 150th Anniversary year, and help from any interested members would be greatly appreciated. Please contact Noel at the address on the back of the journal, for further information.

Annual elections to Council will be held in May. Being on Council is the best way to get to know the workings of the Club, and the range of its interests and involvements. We need new people to share in this. If you think you can help, talk to any of the office-bearers listed on the back of the journal, or to any Council member. We will be glad to hear from you.

Field Naturalists Club of Victoria

Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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